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(Item 5 of the provisional agenda)

REVIEW OF MINERAL RESOURCES DEVELOPMENT ACTIVITIES IN THE REGION, 1982-1984

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PART ONE

ENERGY MINERALS

INTRODUCTION

1. The first part of this document deals primarily with trends in the exploration, development and production of energy mineral resources, petroleum, natural gas and coal, in the Asian and Pacific region during the period 1982-1984.

2. Since the increases in oil prices, the development of domestic supplies of energy has become of major concern to the developing countries in Asia and the Pacific. Even after the reversal in oil prices in 1983, prices are still 15 times the level of 1972. With increased world oil prices, payments for oil imports have become heavy financial burdens for many countries in the region, resulting in unprecedented balance-of-trade deficits, slowed economic growth, under-used capital equipment and lowered productivity.

3. A change in the pattern of energy use, from traditional fuels such as wood and agricultural wastes to commercial fuels such as petroleum and natural gas, coal and hydroelectricity, and an absolute growth in energy use entail change in social and economic development. A given rate of national economic growth has traditionally required a considerably higher rate of growth in commercial energy use. Of the major commercial energy sources, petroleum has long been the key fuel for economic growth, because of its convenience and historically low cost. Since the developing countries in the region have been undergoing industrialization in the era of petroleum-based energy, a large proportion of their energy consumption is dependent on petroleum, even more than is typical for the previously industrialized countries. The expansion in the use of petroleum fuels not only indicates increased industrialization but improved human welfare also. Comprehensive and up-to-date statistics not being readily available, an adequate analysis cannot be made of recent developments in the total energy demand of the developing countries in the region.

4. Although the region was among the more active in the search for oil and gas, exploration statistics leave much to be desired. Further intensification of exploration could possibly make some of the countries in the region, with no apparent or negligible oil and gas production

at present, good prospects as potential producers. Most exploration experts believe that the undiscovered oil and gas potential throughout the region is immense.

5. Transnational oil companies continued to play an important role in oil exploration and production in the region. However, there is also growing concern on the part of the developing countries increasingly to undertake or guide the exploration and development of oil and gas on a national basis. A number of them have succeeded in establishing strong state petroleum enterprises, carrying out accelerated exploration programmes in their own countries. For these countries to be in a position to sustain or, preferably, accelerate their exploration programmes, substantial financial support are required both from national and international sources. Also, the transfer to them of petroleum exploration technologies is crucial to the acceleration of their exploration activities.

6. Coal and natural gas are important potential substitutes for oil, first for electricity generation and then as industrial fuels. Natural gas production and consumption in the producing countries in the region have made significant gains, growth being most rapid in those which have become producers most recently. Several countries in the region are actively pursuing programmes for the development and industrial exploitation of their substantial indigenous gas resources.

7. Coal development in the developing countries in the region has been hampered by inadequate attention and exploration. The resource base and economic considerations would warrant substantial increases in coal production in them. However, potential supplies are constrained by the long lead times involved in opening new mines and the resources involved in the establishment of the transportation infrastructure to link mines to consumers.

8. Opportunities for joint development of energy mineral resources should not be overlooked. At the same time, assistance, bi-lateral and multi-lateral, to the developing countries in energy mineral resource development needs to be substantially expanded. Innovative institutional arrangements and greatly increased technical and planning competence are required in these countries.

I. PETROLEUM

9. Owing to a dramatic change in the direction and pattern of world energy use, the world oil situation has changed profoundly in the past few years. After having increased almost continuously over some decades, energy consumption in industrial countries, accounting for more than 70 per cent of total energy used, declined by about 10 per cent from 1979 to 1983. The share of oil in total primary energy consumption, which had already declined from 53 per cent in 1973 to 51 per cent in 1979, dropped further to about 45 per cent in 1983.

10. The sharp rise in oil prices in 1979-1980 had a strong adverse impact on the demand, and despite the partial reversal in 1982 and 1983 of the previous rise in international oil prices, the real price of petroleum products to end users is estimated to have increased by almost one half during the five-year period from 1978 to 1983. In March 1983, the Organisation of Petroleum Exporting Countries (OPEC) lowered the benchmark price of Arabian light crude oil from an all-time high of US$34 to US$29 a barrel. However, the decline in energy use per unit of output is estimated to have been of about the same magnitude as in 1982.

11. The total oil consumption in the industrial countries declined by an average of 5 per cent a year in the same period. Available information indicates that since 1980 oil consumption in the developing countries in the region, which constitutes a major part of their total use of commercial energy, has been rising much more slowly than in the 1970s, reflecting the reduced pace of economic activity in their non-oil sectors.

12. During the past decade, there have been significant shifts in the distribution of world oil consumption, with the share of the developing countries increasing considerably. This shift became somewhat more pronounced during the period under review. It is estimated that the current distribution of world oil consumption between the industrial and developing countries is about 70 and 30 per cent respectively, a significant change compared with 82 and 18 per cent respectively a decade ago. Although the distribution remained broadly unchanged in 1983-1984, the trend of the past decade is anticipated to resume. With the upturn in economic activity in 1984, total consumption in the developing countries in the region is projected to rise, particularly if their economic growth is maintained at satisfactory rates.

13. Against the background of a continuous fall in oil consumption, the total world production of crude oil and condensate declined to about 9.0 million cubic metres per day (cu m/day)(56.8 million barrels (US) of oil per day (Mbpd)) in 1982 and by a further 70,000 cu metres per day in 1933 to 56.4 Mbpd, a decline of about 14 per cent from a peak of almost 10.5 million cu m/day (66 Mbpd) in 1979. World production of crude oil and condensate registered its first increase in five years in 1984, with total flow averaging about 9.2 million cu m/day (57.8 Mbpd).

14. The three-year decline in the region's total production of crude oil and condensate since 1979, reversed in 1982, having gained 8.5 per cent over the previous year for a total production of about 330 million tons. Although oil production in Indonesia in 1982 declined for the second straight year as a result of curtailment of production, it was offset by healthy production gains in China, India, the Islamic Republic of Iran and Malaysia. 1983 saw a further increase in total production to about 374 million tons, with all major producers in the region registering significant gains. Production gains continued during 1984; Indonesia restored production cutbacks, Malaysia set production records, and Australia, China, India, the Islamic Republic of Iran, Pakistan, the Philippines and Thailand posted significant production increases. While China's offshore production hopes have so far been frustrated, offshore production is a major feature in India, Malaysia and the Philippines.

15. Production in China increased steadily, in line with its targeted oil flow at an average of 2 Mbpd (273,000 tons per day). Total production increased 3.8 per cent in 1983 to 106 million tons over the previous year and a further 7 per cent increase to about 114 million tons in 1984 was estimated. The higher flow came from the onshore fields which previously were thought to have peaked. Big gains were attributed to Shengli field in Shandong province which is China's second largest field after Daqing, the two fields contributing nearly 70 per cent to China's total production.

16. Ninety per cent of the production of crude oil in Australia came from fields in the Bass Strait off Victoria. Total production of crude oil and condensate in the fiscal year 1983/84 was over 21.7 million tons (26.8 million cu m) of which the Bass Strait fields contributed 19.4 million tons (24 million cu m) and the Cooper/Eromanga fields in South Australia some 1.1 million tons (1.4 million cu m). Exploration and

development drilling during the period under review were at record levels and significantly four oil discoveries were made in widely separated basins and in diverse parts of the geologic succession. The most significant discovery was in the Vulcan sub-basin 300 kilometres offshore of north-western Australia from Jurassic sandstone which flowed at 700 bpd of 41° oil. However, the appraisal wells drilled proved essentially dry, forcing a review of development plans. On the opposite side of the continent, 5,700 bpd of 42° oil flowed from Upper Cretaceous sandstone in the Gippsland basin, Victoria. The other significant discoveries were from the Jurassic and Cretaceous sandstones in the Eromanga Basin in Queensland and in the Otway Basin in Victoria from a Lower Tertiary unit where discoveries had been restricted to Cretaceous zones.

17. In Brunei Darussalam, oil production stabilized at about 8 million tons a year during 1982-1984. Production is considerably below rates in the late 1970s (it amounted to 13 million tons in 1979) for a variety of reasons but the main ones appear to be reservoir management and conservation constraints.

18. There has very good progress made in India during the period under review in terms of exploration and production. Oil production hit record levels in 1983, for a total output of 25 million tons, a 27 per cent increase over the 1982 level of 19 million tons and a 68 per cent increase compared with production in 1981 of about 15 million tons. Total production in the first eight months of 1984 was about 18.5 million tons and it appeared that another record level would be achieved in that year. Production increased sharply in Bombay High field as a result of the development of facilities, setting a record early in 1984 at 420,000 bpd (66,775 cu m/day), from 54 platforms. Onshore production averaged about 172,000 bpd (27,345 cu m/day). The entire oil industry in India is now State-owned, the Government having completed the takeover of Oil India Limited. The Oil and Natural Gas Commission of India continued its efforts to boost production from onshore fields, launching its first major drive to increase production from mature oil and gas fields in the Cambay basin in Gujarat. The project estimated to cost $US 955 million is to be partly financed by the World Bank.

19. In Indonesia, total output of crude oil and condensate for 1982 amounted to about 66 million tons, a decline of about 16 per cent compared with total production in 1981. All of the decrease was due to

production cutbacks in line with its OPEC production quota. Production was maintained at the same level in 1983; however, in 1984 it increased by about 7 per cent for a total production of some 70,685,000 tons (1.4 Mbpd).

20. Significant gains were reported in the total crude oil production of the Islamic Republic of Iran, having increased 54 per cent in 1982 for a total output of 98.5 million tons compared to 66 million tons in 1981. In 1983, the Islamic Republic of Iran re-asserted its position as the largest producer in the region, producing a total of 124 million tons, a gain of 26 per cent over 1982. Preliminary figures for the first seven months of 1984 indicated a total production of about the same level as in the previous year. Since early 1980, the National Iranian Oil Company has controlled all onshore and offshore areas. The country's official estimated crude oil reserves which could be produced through primary recovery methods are 6.5 billion tons (48 billion barrels).[1/]

21. With the apparent lifting of production restrictions imposed as conservation measures, total crude oil production in Malaysia in 1982 registered a substantial gain of 17 per cent over 1981 for a total production of about 14.4 million tons. However, as in 1981, production capacity was significantly greater than production. Most of the increase was due to a 41 per cent increase in production in Sabah and a 10 per cent increase in production in Sarawak. In 1983, total oil production increased significantly by almost 26 per cent to 18.3 million tons. In 1984, Malaysian crude oil output reached an all-time high of 21.7 million tons, having gained 18.5 per cent over the previous year. The bulk of the increase came from the fields offshore to Peninsular Malaysia; Sarawak and Sabah had small increases.

22. Japan showed no change essentially in its total oil production in 1982 from previous years, however, it registered a gain of 6 per cent in 1983 over 1982 for a total output of 420,000 tons. Japan reported gas and oil discoveries and successful delineation wells, but reserves appear to be modest and mainly along the west coast. No further indications of oil were reported along the east coast.

/23.

1/ In this review 1 billion = 10^9 and 1 trillion = 10^{12}.

23. Although information on Burma's oil production was incomplete, based on data gathered from industry publications, total crude oil production was seen to have declined during the period under review. From a reported record production of 1,685,000 tons in 1981, the total production declined substantially to 1,278,000 tons in 1982, a loss of 24 per cent. However, production increased to 1.5 million tons in 1983 and to an estimated total of 1,536,000 tons in 1984.

24. In Pakistan, total oil production has increased steadily, at an average annual rate of 7 per cent, for a total output of 545,000 tons in 1983. A significant increase in oil production was expected in 1984. Based on monthly averages up to August, total 1984 output was estimated to reach 760,000 tons.

25. Thailand recorded the most significant production gains in the region during the period under review. Thailand's first onshore crude oil production came onstream in 1982, at the rate of about 4,500 bpd (715 cu m/day) in December 1982, from the Sirikit oilfield in Kamphaeng Phet province. In 1983, the total production from seven wells there averaged 6,150 bpd (978 cu m/day) and in 1984 the production averaged 20,000 bpd (3,180 cu m/day) for a total production of 4.3 million barrels (680,000 cu m). The total production of crude oil and condensate has increased tremendously from 12,000 tons in 1981, to 345,000 tons in 1982, 684,000 tons in 1983 and to 1,314,000 tons in 1984, compared with 1981, a gain of 280 per cent. Thailand has thus been firmly established as a major hydrocarbon producer in the region. Its total natural gas and condensate and crude oil reserves now stand at 12,921.8 billion cubic feet (365 billion cu m), and 179,123,000 barrels (28.5 million cu m) respectively.

26. In the Philippines, with the addition of production facilities in the offshore Matinloc field, augmenting production from the Nido and Cadlao fields, total oil output increased by 116 per cent to 468,000 tons in 1982 over the previous year's total production of 216,000 tons. The three offshore oil-field complexes produced a total of 645,000 tons in 1983, a gain of 38 per cent over the previous year. However, preliminary statistics indicate that production declined to about 531,000 tons in 1984.

27. Petroleum exploration and development drilling activities in the region maintained the vigorous pace set in 1981, with significant and even increased activity in most parts. Exploration drilling registered

continuous gains, 1 per cent in 1982 and 16 per cent in 1983 over the previous years respectively. Seismic activity in 1982 although declining slightly than in 1981, was significantly higher than in the late 1970s, and increased again in 1983. Exploration seismic activity and drilling were for the most part concentrated in the better-known petroliferous basins. In 1984, exploration and development activity faltered and overall drilling levels dropped compared with 1983. Declines in drilling in most countries were only partially offset by healthy increases in Australia, New Zealand and Pakistan. The apparent peaking in total offshore drilling activity in 1984 suggests that some reappraisal was being considered by the industry, possibly because of the oil price issue.

28. Despite the active exploration pace during the period under review, no major oil or gas discoveries were reported in the region. Although a number of discoveries were reported by several countries, reserves in individual finds appear to be modest.

29. Except for China, Indonesia was the most active country and India maintained a steady pace of onshore and offshore exploration. Other countries which had significant activity were Malaysia, Pakistan, the Philippines and Thailand. Only modest progress was recorded in Bangladesh, Japan and Sri Lanka.

30. Australia set a record in exploration and development drilling in 1982 and they remained at about the same levels in 1983. In 1984, onshore exploration climbed to record levels but offshore activity dropped drastically. A major development in 1984 was a shift to onshore exploration activities, concentrated in or near proven areas, with the Cooper-Eromanga and Surat Basins accounting for the major part of activity. Overall, 80 per cent of all drilling in Australia in the 1984-1985 period would be carried out in the Cooper-Eromanga and Surat Basins along with 87 per cent of all seismic activity.

31. New Zealand experienced the most active exploration period in its history, with 1984 setting a record in terms of activity. Oil, gas and condensate were found in several wells on small structures close to the recently discovered McKee field, the country's only producing oil field which came on stream during 1984, with production slated to rise to 5,000 bpd (795 cu m/day) by year-end.

32. In the South Pacific area, there was increased exploration activity in Fiji in 1982, with marine and land seismic surveys and four exploratory wells being drilled. However, all tested dry and exploration activity in 1982-1983 faltered. Papua New Guinea had active exploration carried out with four wells drilled. The appraisal well on the onshore Juha anticline confirmed the gas and condensate discovery. The offshore appraisal well in the Gulf of Papua blew out and was abandoned. Under the sponsorship of CCOP/SOPAC, comprehensive geophysical surveys were carried out in some offshore areas of Solomon Islands, Tonga and Vanuatu.

33. A review of China's offshore areas shows that of 54 wildcat and stepout wells drilled up to mid-1984, 19 were ranked as having commercial potential. In the South China Sea, there has been no commercial discovery; however, in the Gulf of Beibu, two discoveries were confirmed. Onshore, there were encouraging results from the Shengli complex of oil fields and new exploration was carried out in the Western basins, Tarim, Qaidam and Junggar.

34. In India, the offshore Bombay area, where Bombay High field produced most of India's oil, remained the focal point for exploration, development and production. In spite of the extensive exploration activities, no offshore discoveries were announced. Onshore activity was maintained at a vigorous pace. However, no discoveries of significance were recorded.

35. Apart from the six exploration wells drilled in the period 1980-1982, there was practically no new activity in Bangladesh and a significant upturn was not foreseen in the immediate future.

36. Against a background of the announced discovery of three new oil fields in 1981, Burma's Myanma Oil Corporation continued its active exploration programme concentrating on the known petroliferous onshore areas of Central Burma and the Irrawaddy delta, and in the Gulf of Martaban. A major gas discovery in the Gulf of Martaban was announced in late 1982 and the well reportedly flowed at a rate of 39 million cubic feet per day (1.1 million cu m/day) of gas. More exploratory wells have since been drilled confirming the gas discovery and the presence of light crude.

37. Petroleum operations in Indonesia continued at an extremely active pace, with annual increases in seismic data acquisition and exploratory and development drilling in 1982 and in 1983, the peak year

for exploration in the country. In 1984, there was an apparent downturn in the exploration sector, most likely because of the slow pace at which exploration acreage became available. Despite the high success rate for exploratory and delineation wells, no major discoveries appeared to have been made during the period under review.

38. Petroleum activity in the Republic of Korea continued in its territorial waters and in the Japan-Republic of Korea Joint Development Zone. In 1983, for the first time since 1976, there was drilling activity in the territorial waters, but the well (1,211 m) was plugged and abandoned after drilling to basement. There was still no oil or gas production in the Republic of Korea.

39. There was a marked decrease in exploration activity in Malaysia in 1982 compared with 1981 and the decline continued during 1983 and 1984. However, development programmes remained active. Overall exploration and delineation drilling declined 61 per cent compared with 1981. In 1984, only 17 wells were drilled compared with over a hundred wells completed during the 1980-1983 period.

40. Petroleum activity in Pakistan was at the highest level in 1983 when 14 exploratory wells were reported to have been completed, an increase of 40 per cent over 1982. Despite this, as in 1982, a number of operators relinquished their acreage after unsuccessful exploration efforts. Continued development drilling in the Potwar district and the Khaskeli field increased both oil and gas production to record levels. Active exploration efforts continued during 1984 and six finds in as many months were reported.

41. Thailand had a significant increase in exploration activity in 1982, especially in onshore areas where oil and gas discoveries had been made earlier. Of the exploratory and development wells drilled offshore by Union Oil in its effort to boost production, 20 were successful gas and condensate wells. In 1983, the exploratory drilling emphasis shifted from offshore Gulf of Thailand to the onshore basins where 29 exploration and delineation wells were drilled. Seismic acquisition continued at a high level both onshore and offshore. Union Oil carried out a third marine 3-D seismic survey in Baanpot field. Thai Shell also shot a 250 sq km 3-D programme at its Sirikit field. By the end of October 1984, Thai Shell has spudded nine exploratory wells and tested two oil discoveries in its concessions in Phitsanulok and Sukothai provinces.

/Three

Three additional wells were planned and expected to be completed by the end of 1984. Esso drilled its ninth well in its Sakon concession block in north-east Thailand and has reportedly identified gas reserves of 42 billion cu m (1.5 trillion cu ft).

42. During the period under review, the Asia continued to be an active and attractive exploration region. It is evident from the rise in the regional production, the number of wells drilled and the steady progress made during the downturn in the oil industry over the past few years that the region is still attracting large amounts of exploration investment. The last four months of 1984 seemed to portend promising years to follow in the region's search for oil and gas.

II. NATURAL GAS

43. While a paper on oil reserves and resources presented at the eleventh World Petroleum Congress held in August/September 1983 concluded with a warning about possible forthcoming shortages, a parallel paper on natural gas emphasized that there were firm prospects of substantial new gas discoveries in many parts of the world. From the detailed assessment made by a leading expert in this field, while cumulative production of natural gas as at 1 January 1983 was about 680 billion cu m (24 trillion cu ft) in the Asian and Pacific region (excluding the Islamic Republic of Iran), there were proved reserves of 9,345 billion cu m (330 trillion cu ft) for an estimated ultimate reserve total of 15,149 billion cu m (535 trillion cu ft), representing about 5.6 per cent of the world's ultimate total. The Islamic Republic of Iran has 16 per cent of the world's estimated proved reserves of natural gas amounting to 13.7 trillion cu m (483 trillion cu ft), the second largest in the world.

44. Natural gas consumption and, consequently, production have risen sharply, but world-wide exploration has made it possible to multiply the world's proved reserves eleven-fold since 1950. In the region, output of natural gas continued to make healthy gains, with all the major producing countries in the region reporting varying degrees of gains throughout the period under review, the largest increases being registered by Bangladesh, Burma, India, Indonesia, Malaysia, Pakistan and Thailand amongst the developing countries. There was also increased activity in gas processing consequent to increased production and to the rising tide of captured associated gas from oil production.

45. Indonesia was the largest natural gas producer in the region averaging about 59,250,000 cu m/day (about 2 billion cu ft/day) in 1983, most of which was exported as LNG from the Bontang and Arun LNG facilities. Commercial sales volume amounted to 21,625,000 cu m in 1983, up 25 per cent compared to 16,740,000 cu m in 1982. A significant increase was estimated for 1984.

46. Annual gas production in China during the period under review remained stable at about 12,000 million cu m/year (1.2 billion cu ft/day), declining from peak of 14,500 million cu m in 1979. Half of the gas currently produced was from fields in Sichuan province, while the other half was associated gas from the oil fields in the north-east. Most of the gas was used locally in the field or in fertilizer plants nearby. It is likely that drilling in the Sichuan and Qaidam basins increased known gas reserves and productive capacity and when development of the offshore gas discovery south of Hainan Island occurs, it will substantially increase China's natural gas output.

47. In Australia, natural gas production increased steadily by about 2.8 per cent in 1982 and 1983 and a gain of 6.8 per cent was estimated in 1984 for a total of 12,700 million cu m compared to 11,910 million cu m in 1983. Since 1982, numerous onshore gas discoveries have been made in the Bowen-Surat, Eromanga-Cooper, Amadeus, Perth and Carnarvon basins. Significant offshore discoveries were located off Western Australia and in the Gippsland Basin of Victoria.

48. Natural gas production in New Zealand gained significantly in 1982, amounting to 1,900 million cu m, up 178 per cent over the previous year. 1983 saw a relatively modest gain of 7.9 per cent for a total of 2,050 million cu m. The total gas production in 1984 was estimated at 2,500 million cu m an increase of 22 per cent compared to 1983.

49. In Bangladesh, natural gas production made substantial progress in spite of the relatively slow pace of exploration and development drilling. Gas production increased to 1,834 million cu m in 1982 from 1,556 million cu m in 1981 and further gained 11 per cent to 2,042 million cu m in 1983. A 22-per cent gain in 1984 compared to 1983 was estimated in 1984 for a total of about 2,506 million cu m.

50. Burma's gas production rose about 3.5 per cent to 596 million cu m in 1982 compared with 1981 and further gained significantly by 16 per cent to 692 million cu m in 1983. In what was officially described as a huge

/deposit,

deposit, a natural gas discovery offshore was announced in November 1982 with a flow rate of 1.1 million cu m/day. Subsequent delineation wells reportedly confirmed the discovery.

51. Natural gas production in Brunei Darussalam totalled 9,458 million cu m in 1982 and gained 2.8 per cent to 9,728 million cu m in 1983. Projects to utilize associated gas to the full were installed in 1983 and the slight increase in production may be a result of those efforts.

52. India has made significant gains in natural gas production having increased 45 per cent in 1982 for an output of 2,565 million cu m compared with 1,769 million cu m in 1981. It further gained 22 per cent for a record high of 3,122 million cu m in 1983. The level of production was estimated to have been maintained in 1984. India's natural gas production capacity continued to build. However, production was curtailed while a distribution system was being constructed.

53. Although reliable date was not available for 1983 and 1984, natural gas production in the Islamic Republic of Iran increased significantly in 1982 by 47 per cent to 9,213 million cu m compared with 6,271 million cu m in 1981. Two major gas developments were reported, one in the southern Gulf area and the other in the south-west of the country.

54. Pakistan registered a significant increase in its natural gas production from 8,373 million cu m in 1982 to 10,020 million cu m in 1983, a gain of 19 per cent. Production in 1984 was estimated to remain at the same level.

55. Domestic natural gas production in Japan remained unchanged at about 2,300 million cu m annually during the period under review.

56. Total natural gas production in Thailand from the offshore Erawan and Baanpot gas fields in the Gulf of Thailand in 1984 averaged about 7,075,000 cu m/day (250 million cu ft) together with 9,000 barrels condensate per day compared to the 1983 average of 4,528,000 cu m/day (160 million cu ft) and 6,500 barrels condensate per day; as a consequence of successful workover and development drilling in the Erawan field and commencement of production from the Baanpot field. Natural gas production which began in September 1981, averaged 2.8 million cu m/day (98 million cu ft) during that year and rose to an average of 4 million cu m/day (138.5 million cu ft) in 1982. Natural gas and condensate outputs were expected to rise when two additional offshore gas fields, Platong and

/Table 1.

Table 1. Summary of oil and natural gas production in selected countries in the Asian and Pacific region

Country	1981		1982		1983				1984	
	Gas (cu m (million))	Oil (tons (thousand))	Gas (cu m (million))	Oil (tons (thousand))	Gas (cu m (million))	Oil (tons (thousand))	Percentage change from 1982		Gas (cu m (million))	Oil (tons (thousand))
							Gas	Oil		
Afghanistan	1 914	22[a]	...	...	...	...	...	...	...	...
Australia	11 268	19 653	11 594	17 760	11 914	20 711	+2.8	+16.6	12 716[a]	22 601[a]
Bangladesh	1 556	-	1 834	-	2 042	-	+11.3	-	2 506[a]	-
Brunei Darussalam	9 391	7 933	9 458	8 026	9 728	7 967	+2.8	0.7	...	...
Burma	576	1 685	596	1 278	692	1 500	+16	-5.3	...	1 536[a]
China	12 700	101 220	11 900	102 120	12 210	106 068	+2	+3.8	12 400[a]	114 500[a]
India	1 769	14 925	2 565	19 735	3 122	25 161	+21	+27	2 960[a]	27 681[a]
Indonesia	16 740	78 848	17 320	65 985	21 625	65 916	+25	0	...	70 685[a]
Islamic Republic of Iran	6 271	66 000	9 213	98 500	...	124 116	...	+26	...	112 230[a]
Japan	2 386	385	2 285	410	2 311	410	+1	0	2 195	410
Malaysia	2 419	12 220	3 474	14 543	7 464	18 285	+114	+26	...	21 671[a]
New Zealand	1 070	408[b]	1 900	660[b]	2 050	648[b]	+7.9	-1.8	2 500[a]	750[b]
Pakistan	8 060	477	8 373	514	10 020	545	+19	+6	10 150[a]	760[a]
Philippines	0	216	0	468	0	645	...	+38	0	531
Thailand		12	1 432	345	1 654	684	...	...	2 584	1 314[a]

Sources: United Nations, Statistical Bulletin for Asia and the Pacific, Monthly Bulletin of Statistics, and country sources.

a/ Preliminary estimates.

b/ Condensate.

To convert of tons to US barrels, multiply by factor as below:

Australia	7.775	China	7.300	Islamic Republic of Iran	7.370	New Zealand	8.043
Brunei Darussalam	7.334	India	7.441	Japan	7.352	Pakistan	7.308
Burma	7.464	Indonesia	7.348	Malaysia	7.709		

Satun commence operation, for an average of 10 million cu m/day (350 million cu ft). A natural gas separation plant with a processing capacity of 10 million cu m/day, construction of which began in November 1982, went on trial run in November 1984 on schedule.

57. Malaysia's total natural gas production increased markedly when gas production began in eastern Malaysia. The first commercial non-associated gas from offshore Sarawak was delivered to the Bintulu LNG facility. The first LNG gas shipment was made in late 1983. Although Peninsula-Malaysia had no commercial gas production, gathering systems were being prepared to supply to onshore facilities; some of the gas will be associated gas. Total gas production in Malaysia was reportedly 7,469 million cu m (722 million cu ft/day) in 1983, a tremendous gain of 114 per cent over the 1982 output of 3,474 million cu m (336 million cu ft/day).

III. COAL

58. The global and regional economic configurations were essentially characterized by oil and natural gas as the primary energy sources. However, with the drastic increase in oil prices, there has been a serious search for alternative energy sources, and coal has re-emerged as an important fuel with a promising future after having dropped to less than 30 per cent of the world's energy requirements in 1980, while the combined share of oil and natural gas rose to almost 70 per cent. The roles of the two fuels had reversed, as in the 1950s coal accounted for 60 per cent of all primary energy production and oil at that time contributed only 30 per cent to the world's energy requirements. The main reason for the shift away from coal to petroleum and natural gas was the low cost of those fuels. The substantial increase in oil prices in 1979-1980 made coal strongly competitive again.

59. Although a substantial amount of coal exploration and pre-investment work has been undertaken in several of the developing countries in the region, only a few coal mines are currently being developed. The coal reserves in those developing countries could support much higher production. However, potential new supplies are constrained by the long lead times required; at least four to six years depending on the nature of the deposit. The other major constraint is the long lead times and resources required in the construction of the coal supply infrastructure such as roads, railways, riverine transport and handling facilities, that links the coal mines to consumers.

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60. For the foreseeable future, most of the energy generated from coal in the region would be in heat production. Coal is also a particularly versatile energy material and chemical feedstock, the conversion potential of which is unmatched by any other alternative energy source, ranging from electric energy and heat, gaseous and liquid energy material, chemical feedstock and metallurgical coke. However, the potential of coal is overshadowed by serious technological constraints, it being a solid matter, of low hydrogen content and intergrown with mineral matter. Recovery, transport and conversion of coal require relatively complex and expensive processes and equipment. In most cases, infrastructure requirements involve the bulk of the development costs, as the coal mine proper usually represents only about one third of the total investment. Further, synthetic fuels from coal are not expected to be developed on any commercial scale in the decade ahead but could have some impact on coal demand towards the end of the century if oil prices increase significantly.

61. The foregoing notwithstanding, the traditional coal-producing countries in the region all registered significant increases in their productions during the period under review. China and India set new production records, having embarked on modernization and mechanization programmes in their coal industries. Production of coal in Australia grew at an increasing rate during the 1982-1984 period, with record levels in production, consumption and trade in 1984.

62. As part of its overall plan to quadruple the national economy by the turn of the century, China planned to add 80 million tons of new coal to its annual output by 1985 under its Sixth Five Year Plan (1981-1985). China exceeded its coal production target two years ahead of schedule by producing 700 million tons of coal in 1983, compared with 620 million tons in 1981. This made China the largest coal producer, just ahead of the United States of America with 680 million tons and the Union of Soviet Socialist Republics at 500 million tons. The total coal production in 1984 was estimated at about 770 million tons, an increase of 24 per cent compared with 1981. Coal is China's main energy source accounting for 70 per cent of the country's total energy consumption, and is expected to remain the chief source until 2000. Exports of coal from China amounted to 6,510,000 tons in 1983, marginally up on the figure of 6,400,000 tons in 1982. Major importers of Chinese coal were Japan (3,680,000 tons),

the Democratic People's Republic of Korea (2,050,000 tons), Bangladesh, Hong Kong and Macau. China, which has one of the world's largest coal reserves, recently reported verified coal reserves of 781.5 billion tons, after verifying an additional 11.7 billion tons in 1984.

63. Coal is India's largest mineral resource, with reserves estimated at some 114 billion tons of which some 23 billion tons are of coking quality. The industry has nearly 400 collieries, of which 22 yield over 500,000 tons per year. Total hard coal production in India reached an estimated all-time high of 140 million tons during the financial year 1 April 1983 to 31 March 1984, against some 130.6 million tons in the previous year. Lignite production in 1983 reached a record level of 7,340,000 tons which was estimated to have further increased to about 7.9 million tons in 1984. Most of the lignite production came from the Neyveli area and was chiefly used for mineside power generation.

64. Australia's coal output has steadily risen, and in 1984 production, consumption and exports all reached record levels. Production of saleable coal also grew substantially in the period to reach 114 million tons in 1984, a 16 per cent increase over 1983. Queensland and New South Wales dominated production accounting for about 95 per cent of the total Australian output of saleable coal. Domestic consumption increased to 40 million tons in 1984. Almost two thirds of the saleable coal output, or about twice the domestic consumption, was exported: Australia's exports of coal increased substantially during 1984 to reach a record 76 million tons compared with 60.5 million tons in 1983. Most of the growth resulted from a rapid expansion in exports of steam coal (up 10 million tons to 29 million tons). Coking coal grew by 5 million tons to 47 million tons in 1984. Coal was exported to 37 countries.

65. In Australia, brown coal is produced only in Victoria, where the State Electricity Commission mines more than 95 per cent of the State's total output from the Latrobe Valley. All brown coal is used for domestic consumption. Production of brown coal was a record in 1982 (37.8 million tons) but has fallen back to about 34 million tons per year.

66. The other main producers of coal in the region, the Democratic People's Republic of Korea, Japan and the Republic of Korea, all maintained their coal production levels in the period under review. The principal mineral resource of the Democratic People's Republic of Korea

is coal and the yearly output was gradually increased. New coal mines were opened to reach the production target of 70 to 80 million tons a year and coal production in 1984, the final year of the second seven-year plan, was officially estimated at 70 million tons.

67. Domestic availability of coal and the stability of economic supplies underpin Japan's national coal policy, the seventh phase of which was established in 1982. The primary objective of the policy was to maintain present production levels, at about 17.5 million tons, and to achieve a 20 million ton per year capacity in the near future. Japan remains the largest coal-importing country in the world. Coal imports were up in the financial year ending 31 March 1984, reaching 78,730,000 tons compared with 76,250,000 tons the previous year. Australia was the major supplier with sales totalling 36.8 million tons in fiscal 1983/84 compared with 24.3 million tons the previous year.

68. Particular attention was being devoted to coal in the Republic of Korea, as it constitutes the only domestic energy resource. Production of anthracite increased to 20,116,000 tons in 1982 compared with 19,865,000 tons in 1981. Production further rose in 1984 to an all-time peak of 21,370,000 tons. Total reserves are estimated at 1,450 million tons, almost entirely of anthracite, with recoverable reserves of some 550 million tons. Output comes from about 190 mines, of which 10 each produce more than 500,000 tons a year. The Republic of Korea has no reserves of coking/bituminous coal and imports have been increasing in recent years, 9,839,000 tons in 1982, 10,151,000 tons in 1983 and 12,937,000 tons in 1984.

69. Coal production in New Zealand increased steadily, reaching 2,041,000 tons in 1982 and further increasing to 2,217,000 tons in 1983. The output of coal in 1984 was estimated at 2.3 million tons. Similarly, lignite production expanded to a record level of 231,000 tons in 1983.

70. Pakistan's total production of coal gained substantially to reach 1,765,000 tons in 1982, having gained 10.5 per cent over the 1,597,000 tons in 1981. Total production in 1984 was estimated to have increased to about 1.8 million tons. Mechanization of the Lokhra coal mines with a production capacity of 1.4 million tons/year was being upgraded to meet the needs of the proposed mine-side 300 MW coal-based power plant.

71. Lignite production in Thailand reached a record 2,337,000 tons in 1984. Production in 1982 had been 1,964,000 tons and in 1983 had declined to 1,866,000 tons. Proven reserves were placed at 180 million tons with probable reserves at 600 million tons. The bulk of the production was won from the Mae Moh mine in Lampang province used for mine-side thermal power generating plants. The second stage of an expansion project was being carried out which will expand the open-pit capacity to 5 million tons/year by 1986. A third stage of expansion at Mae Moh is scheduled for 1986-1989 to bring capacity to 12 million tons/year. Lignite was also mined in Krabi province in southern Thailand (380,000 tons in 1983, 340,000 tons in 1984); in northern Thailand in Lamphun province (134,000 tons in 1983), and in Tak province (67,000 tons in 1983) from where the output went to the cement industry; and in north-eastern Thailand in Loei province (6,120 tons in 1982, 11,100 tons in 1983).

72. Indonesia pursued its energy diversification in earnest, with the development of the coal sector making rapid progress during the period under review. Total coal output in 1982 increased significantly to 481,000 tons, up 37.5 per cent compared with the 350,000 tons in 1981. Production in the first six months of 1984 was estimated at 427,000 tons and thus appeared headed for a record output. The prospects of coal were further enhanced with its increased use in power generation and cement manufacture. The cement industry announced a major conversion programme from oil to coal burning and that all new cement plants will be designed for coal burning at the outset. During the period under review, there was a continued influx of foreign investors working under specific contracts with PN Tambang Batubara, the State coal enterprise.

73. Coal production in the Philippines made significant gains during the period. It gained 240 per cent for a total record production of 1,245,000 tons in 1984 compared to 367,000 tons in 1981. Output in 1982 gained 52 per cent over the previous year for a total of 557,000 tons and in 1983 production having gained 83 per cent, crossed the 1 million tons mark for the first time, amounting to 1,020,000 tons. With the completion of most of the coal conversion programmes of the cement industry from bunker fuel oil to pulverized coal-firing, the cement industry was the largest user of coal, about 48 per cent of total use in 1984. Thermal power generating plants of several mining industries were also converted to coal-firing, using over 40 per cent of total use. The bulk of the

production, 90 per cent of the total, was won from three main producers in Cebu with the remaining coming from small local producers in the southern islands. Continuing exploration programmes have increased the total of known coal reserves in the Philippines to 305 million tons at the end of 1983. There was a significant increase in the number of service contracts for coal development with an improved investment atmosphere having attracted a number of companies to participate.

Table 2. Coal production in selected countries in the Asian and Pacific region

(Thousands of tons)

Country	1981	1982	1983	1984
Afghanistan	125	...	...	...
Australia	110 939	119 038	109 011	125 900[a/]
Lignite	32 959	37 821	34 191	34 600[a/]
Burma	30	...	...	...
China[b/]	622 000	666 000	715 000	772 000[a/]
India	123 012	128 304	134 832	...
Lignite	5 961	6 673	7 366	7 900[a/]
Indonesia	350	481	486	...
Japan[c/]	17 687	18 300	17 800	17 000[a/]
Mongolia	410	...	...	...
Lignite	4 200	...	...	...
New Zealand	1 949	2 041	2 217	2 300[a/]
Lignite	212	209	231	220[a/]
Pakistan	1 597	1 765	1 707	1 800[a/]
Philippines	367	557	1 020	1 245
Republic of Korea	19 865	20 116	19 861	21 370
Thailand (lignite)	1 686	1 964	1 866	2 337
Viet Nam	6 500	6 500	6 500	...

a/ Estimated.

b/ Including lignite.

c/ Including lignite (about 7 per cent of total).

PART TWO. METALS AND MINERALS

INTRODUCTION

74. Data and information contained in the review on the development and production in the period 1982-1984 of selected metals and minerals of significance in the region was largely derived and synthesized from country reports, technical and trade journals and bulletins, and the publications of the United Nations and other international organizations.[2/] Not all of the total mine production figures in the period were available at the time; some of the mine outputs shown as estimated figures were extrapolated or inferred from past productions.

75. The mining industry worldwide has encountered serious difficulties in the past few years, as the impact of one of the most severe recessions in recent history superimposed upon the mining industry already experiencing the effects of other fundamental changes in the patterns of metal consumption. Although the mineral industry in the Asian and Pacific region for the most part showed a sustained rate of production during the last triennial review period of 1979-1981, despite a climate of economic uncertainty, the full force of the world economic recession came to bear on the region's mineral and metal production in 1982 and 1983. Further stagnation of prices in 1982-1983 and declines in 1984 have seriously affected virtually all mineral and metal producing developing countries in the region. Although there was a reversal in the recessionary situation in the latter part of 1984, the recent growth of the world economy has not led to substantial price increases for most metals and minerals, as the structural decline in rates of growth of consumption and sustained production in many countries have resulted in overcapacity and pressure on prices. The prices of several metals and minerals were in real terms at or near record low levels. Nevertheless, citing social and economic imperatives, such as foreign exchange earnings and domestic employment, governments of developing countries kept their mines in production. Despite an overhang in the metal market, increasing

/production

2/ Sources include country reports, Engineering and Mining Journal, ESCAP Quarterly Bulletin of Statistics for Asia and the Pacific, Mining Annual Review, Mining Journal, United Nations Monthly Bulletin of Statistics, United States Bureau of Mines, Mineral Commodity Summaries and Minerals Yearbook Preprints.

production, if technically feasible, may be warranted as it can be argued that for some metals, such as copper, prices have to remain low so as to remain competitive over the long term against substitution.

76. Over the past six years it has become statistically evident that a slowing down is occurring in the rate of growth of metal consumption in the industrial countries. Most commodity analyses have indicated that this slowing down is long-term rather than short-term and is due to a change in the consumption patterns in the industrial countries. The fact that the very considerable fall in the real prices of metals has not stimulated an accelerated growth in consumption seemed to argue for a permanent rather than a temporary change.

77. However, upon viewing the current situation from the standpoint of the consumer, it will be noted that most of the world's population are as yet barely metal users at all. The comparative disparity in consumption between the most industrialized nations and the developing countries is huge. More than 80 per cent of most major metals, copper, zinc, raw steel, etc., is consumed by only 30 per cent of the world's population. It is a fact that an increased consumption of metals is an important measure of the improvement of a nation's economy. With the expansion of the economy of the developing countries there would be a corresponding rise in the rate of growth of metals and minerals consumption. However, the stronger than average demand growth in developing countries is not yet sufficient to compensate for the weak demand performance of the industrial countries given that their consumption shares though growing are still small.

78. The mineral industry of the Asian and Pacific region, apart from being a critical factor in the overall economic development of the region, also contributes significantly to world mineral supply. The region is a significant producer of nickel, chromite, cobalt, tantalum, tin, tungsten, copper, antimony and gold. Clearly the region offers considerable potential for further expansion of its component mineral industries, both in terms of direct mineral production and through the downstream processing of raw materials. There is a growing trend towards the smelting and refining of ore in the country of origin. It is evident that the disruptive impact of price fluctuations can become less important as mineral producers expand their processing and fabrication operations.

79. Although the region is known to possess substantial mineral resources, the actual potential could be much greater because large parts of the region have yet to be explored and evaluated using modern exploration techniques. By far the most significant trend in recent years has been the increased use of microprocessor-based field data acquisition and processing systems. This has brought about significant improvements in both the volume and plurality of the data recorded together with some reductions in cost. The successful application of new technologies and techniques to resource assessment depends to a large extent on the development of a comprehensive database and the potential importance of data banks. While the usefulness of genetic models and sophisticated data bank analyses are readily acknowledged, there is no substitute for practical experience in mineral exploration.

80. The stagnation in mineral resources exploration in the region represents a potentially serious problem for the future industrial growth of the developing countries. Because the very nature of the mining industry is based on the exploitation of a diminishing resource, the maintenance of long-term exploration programmes must be of paramount importance.

I. IRON ORE AND ORES FOR FERRO-ALLOYS

A. Iron ore

81. World production of and trade in iron ore declined in the period owing to the depressed demand for iron and steel in most industrial countries. Production in 1982 of about 790.6 million tons was down 9 per cent from 1981 and a further contraction occurred in 1983 to about 762.0 metric tons. Production in 1984 further declined as more production curtailments and closures were implemented.

82. Worldwide raw-steel production, after having made a modest recovery in 1983, further gained in 1984 as raw-steel outputs in the European Community, the United States and Japan advanced on the average about 10 per cent over the previous year. However, this was still significantly down compared with 1979 which was the last peak year. Although the steel industry was shrinking in the industrial countries, it was expanding in the developing countries. A case in point in the region is the outstanding growth of the steel industry in the Republic of Korea which produced less than 0.5 million tons in the early 1970s, but yet in 1983 and 1984 produced some 12 million tons/year. China has also

substantially expanded its steel capacity, with the expansion of existing iron and steel complexes and construction of a new plant near Shanghai with a capacity of 3 million tons.

83. Most of the major iron ore producing countries in the region registered varying degrees of decline in their output in 1983 compared with 1982. Australia experienced a sharp decline in its iron ore output in 1983 of 71 million tons, down 19 per cent on the 1982 output of 87.7 million tons. The decline appeared to be caused by reduced sales to Japan and by industrial disputes. Several iron ore mines were closed in the period owing to either depleted reserves or reduced markets. However, a recovery in world steel output in 1983 and 1984 and the emergence of new markets for Australian iron ore resulted in a substantial increase in iron ore production and sales in 1984; exports returned to levels achieved only in the mid 1970s. There was a significant development in the export market when possibilities for increased trade with China emerged in 1984, China having contracted to purchase 4 million tons of iron ore during the year. The decline in exports of iron ore to Japan in 1982 and 1983 was offset by increased shipments to Europe, the Republic of Korea, and China including Taiwan Province. Exports to Japan recovered in 1984 reflecting higher Japanese steel output.

84. The annual iron ore production in China was estimated at about 112 to 114 metric tons consisting mostly of low grade ore, about 30 per cent iron. Iron ore mines are distributed throughout most of the provinces and autonomous regions. Proven reserves are estimated at over 40 billion tons. Major iron ore facilities continued to be renovated and modernized and China's largest iron and steel complex at Anshan was being modified for expanded production and improved quality in the varieties of steel and increased efficiency.

85. Iron ore production in India declined by some 9 per cent in 1983 for a total output of 37.9 million tons compared with an annual output of about 42 million tons in the previous years. The drop in production was due to a decline in exports resulting particularly from the reduced offtake by Japan, the largest buyer. Romania, the second largest buyer in 1981/82, virtually ceased its purchase in the following fiscal year. However, in 1984 preliminary production figures indicate resumption of production at former levels. With the continuing poor export demand, there was a shortfall in the export target of 15 million tons in 1982/83

/by

by the state-owned Minerals and Metals Trading Corporation as it could export only 12.2 million tons of ore. Total exports in 1983/84 were at reduced levels, estimated at about 13 million tons. Private shippers in Goa exported about 8.5 million tons annually, mostly to Japan. However, the pelletization plant at Pale remained closed for an extended period owing to the fall in prices of pellets to uneconomic levels. Apart from two pellet plants in the private sector and another in the joint sector, a fourth pelletization plant with a capacity of 3 million tons/year of direct-reduction grade pellets was being constructed at Bangalore in conjunction with the Kudremukh project, India's largest mining project at Chikmagalur in Karnataka. India has substantial iron ore resources, with total deposits estimated at some 13.5 billion tons of which 10.5 billion tons are hematite and 3 billion tons are magnetite.

86. In Malaysia, mine output of iron ore from eight operating mines declined substantially. The largest iron mine is at Gunung Jerain in Kedah and accounted for about 20 per cent of the total output. Iron ore production in 1982 of 341,000 tons was down sharply by 36 per cent from 1981 and further dropped drastically to 114,000 tons in 1983. Output in 1984 increased to 194,000 tons. Falling demand and rising production costs, among others, were cited by the industry sources as the main causes for the decline. The bulk of the mine production was shipped to the iron reduction plant in the Patani area of south Kedah. A direct reduction plant was being built on Labuan Island with a capacity of 650,000 tons/year. Construction also continued on the 600,000 tons/year direct-reduction plant in Trengganu on the east coast of Peninsular Malaysia.

87. Japan was the major importing country of the region's iron ore. Imports in 1983 totalling some 110 million tons were however, about 13 million tons less than in 1982. Of the imports included were 11 million tons of pellets and 3 million tons of sinter. The larger imports from the region in 1983 consisted of 50 million tons from Australia and 14.7 million tons from India.

88. Iron ore production in the Philippines virtually ceased in 1984 with no production reported for that year after having dropped sharply by 53 per cent to 2,645,000 tons in 1983 from 5,573,000 tons in 1982 which was itself down 3 per cent from the 1981 production of 5,749,000 tons.

89. New Zealand's magnetite beach sand production declined to about 2.8 million tons in 1982 from 3.2 million tons in 1981 and further dropped to 2.2 million tons in 1983. Exports of the beach-sand magnetite totalled 2,386,000 tons in 1982 and 2,486,000 tons in 1983 with the excess on the total mine output for the year coming from the stockpile.

90. The profitability of iron ore producers around the world is being severely squeezed owing to a combination of low prices and low shipment levels. Further, in recent years there have been substantial changes in steel mill feed requirements. Besides requiring higher quality feed, current blast furnace practice has been strongly influenced by the need to reduce costs, particularly energy costs. As a result there has been increased demand for sinter rather than for pellets or lump.

Table 3. Iron ore production in selected countries of the Asian and Pacific region

(Thousand tons)

Country	1981	1982	1983	1984
Australia	84 661	87 694	71 036	43 582[a/]
China	107 000	107 000	113 390	...
Democratic People's Republic of Korea (Fe content)	3 250	...	...	...
India	41 460	42 000	37 992	22 410[a/]
Indonesia	87	144	126	45[a/]
Islamic Republic of Iran	366	...	...	...
Japan	441	362	298	325
Malaysia	532	341	114	194
New Zealand (iron sand)	3 200	2 792	2 203	...
Philippines	5 749	5 573	2 645	-
Republic of Korea	590	620	655	625
Thailand	62	28	40	...

a/ January - June

B. Manganese

91. Manganese is a vital element to modern industrial society, being an essential ingredient of steel and steel-making. Despite being a relatively common metal in terms of crustal abundance, the geographical distribution of land-based manganese ore deposits of economic size and grade (defined as those containing a minimum of 35 per cent Mn) is comparatively restricted. Current world reserves and production trends indicate that production could become even more centralized in the future. An estimated 80 per cent of identified resources are located in South Africa and the USSR and 95 per cent of current world output comes from just seven countries. Many industrial nations, including those in Western Europe and Japan are nearly totally dependent on imports for their manganese supply, while in the United States domestic mine production is nil.

92. With the continued depressed state of the steel industry, manganese continued to be in oversupply world-wide. On a constant dollar basis, manganese ore prices in 1983 fell to record low levels and demand for alloy grade materials was very weak. Although prices remained weak in 1984, firmer world economic conditions underpinned ore and ferro-manganese prices.

93. Demand for Australian manganese ore remained depressed in 1982 because of world oversupply and reduced requirements of the domestic steel industry. Mine production in 1982 was registered at 1,127,000 tons, down 22 per cent from 1981. Although demand for manganese ore remained depressed in 1983, Australian exports increased in that year as new markets were established in the USSR, Mexico and the Federal Republic of Germany, offsetting decreased shipments to Japan, the major market. Additional markets with potential for growth were established in China in 1984. Mine production in 1983 increased to 1,370,000 tons and in the first six-months of 1984 was registered at 917,000 tons and thus appeared headed for a high level of production.

94. Mine production of manganese ore in China was sustained in the period at about 1.6 million tons. With the apparent shortage of manganese resulting from the substantial increases in steel production, China reportedly purchased 100,000 tons in 1983. Discovery of a large manganese deposit in Daxin, Guangxi was reported to contain resources exceeding 100 million tons.

/95.

95. India's production of manganese ore declined substantially to 1,270,000 tons in 1983, down 10 per cent on the output of 1,420,000 tons in 1982. The drop in production was due to depressed export market conditions, particularly the drastic cut in purchases by Japan, the largest buyer. Domestic consumption also declined with the drop in both ferro-manganese and steel production. Export restrictions as a measure of conservation remained in force, preventing the export of high grade ore and restricting exports to lower grades. India has substantial reserves of manganese estimated at 117 million tons, of which about 18 million tons are of high grade.

96. Manganese ore production in the Philippines dropped sharply in 1982 to 1,556 tons from 3,113 tons in the previous year. Production gained marginally in 1983 to 2,242 tons which again dropped to a low of 1,174 tons in 1984.

97. Thailand's production of metallurgical grade manganese ore suffered a severe decline, dropping to a low of 1,906 tons in 1983 compared with 28,156 tons in 1979, a direct consequence of the drastic cut in offtake of the ore by Japan, which virtually ceased in 1982 and 1983. Metallurgical grade ore output in 1984 marginally increased to 2,577 tons. Output of battery grade ore made successive gains in the period from 3,398 tons in 1982 to 6,110 tons in 1984, significantly down, however, compared with the peak levels in the late 1970s.

98. The manganese only mine in Vanuatu, located at Forari, north-west of Port Vila, remained closed. Some 120,000 tons of reserves reportedly remain in the mine. While in production, the mine shipped 42 per cent metallurgical grade manganese mainly to Japan.

99. Future prospects for manganese are obviously tied to the fortunes of the steel industry which, while showing some improvement has yet to achieve full recovery. Ore prices are unlikely to improve significantly in the shorterm although the outlook for manganese alloy and manganese metal ore is somewhat better. New technology could see greater use of the metal in special steel applications where no convenient substitute is yet available.

C. Nickel

100. The nickel market rebounded in 1983, with demand rising 16 per cent, reversing a downward trend in the previous four-year period.

/Table 4.

Table 4. Manganese ore production in selected countries in the Asian and Pacific region

(Tons)

Country	1981	1982	1983	1984
Australia	1 449 000	1 127 000	1 270 000	917 000[a/]
China	1 600 000	1 600 000	1 550 000[b/]	...
India	1 456 000	1 420 000	1 270 000	...
Indonesia (Mn content)	2 587	...	...	...
Japan	86 696	78 045	75 199	61 635
Malaysia	-	-	-	-
Philippines	3 113	1 556	2 242	1 174
Republic of Korea	-	-	-	-
Thailand (all grades)	10 917	7 758	6 710	8 687

a/ January - June

b/ Estimated.

Consumption of nickel in the market economy countries further increased in 1984 by some 12 per cent on 1983 to slightly below the peak level in 1979. Much of the strength of demand for nickel reflected the unprecedented level of stainless steel production. However, despite the healthy market fundamentals during 1984, nickel prices remained soft throughout the year, albeit advancing to a five-year high of about £ 4,000 per ton (London Metal Exchange) at one point in October 1984.

101. Following a strong growth to a record of 87,552 tons of nickel in 1982, Australian mine production declined in 1983 to 76,625 tons because of cutbacks in production and mine closures. Mine production in the first half of 1984 was registered at 37,032 tons. Australia's identified nickel resources, both sulphides and laterites, were estimated at about 9 million tons of nickel metal.

102. Mine output of nickel in China was estimated to have declined to about 8,000 tons in 1983. The bulk of the production came from the Jichuan deposit in Western Gansu province, a large nickel-copper sulphide deposit with reserves estimated at 5.3 million tons of nickel metal. One underground mine and one open-pit mine were in operation. Ore from the underground mine contains up to 5 per cent nickel. Electrolytic nickel production capacity was about 17,000 tons in 1983.

103. In India, a very small quantity of nickel was produced as a by-product by Hindustan Copper Ltd. Nickeliferous laterite deposits have been mapped in Orissa at Kansa, Kurmadah, Sarvabil, Sundergarh, Kalapani, Sukinda and Simlipal. The total reserves are estimated to be about 138 million tons containing 0.97 to 1.09 per cent nickel; some 95 per cent of these reserves are found in Sukinda. Although there has been no development of this potential, there were plans to exploit the Sukinda deposits for nickel and cobalt.

104. Nickel ore production in Indonesia was at a high of about 1,640,000 tons, about 50,000 tons of contained metal, in 1982, which however dropped to about 1,280,000 ton, about 47,000 tons of contained metal, in 1983. Nickel ore production was from the mines at Pomaala, Sulawesi, and Gebe Island, Moluccas, operated by the state-owned PT Aneka Tambang. Exports of nickel ore in 1983, were at a nadir for a decade at 737,000 tons compared with just over 1 million tons in 1982. However, ferro-nickel exports by the company improved to a record 5,720 tons, up 30 per cent on 1982. A similar rise in production was recorded by PT Inco Indonesia output of

nickel matte, which rose to 18,280 tons, exports rising 12 per cent to 17,150 tons. Ore production by PT Inco is from the Soroaka area of South Sulawesi.

105. Philippines nickel output declined significantly in the period, down 50 per cent to 11,894 tons of metal in 1984 compared with 23,928 tons in 1981. The decline in the output was the result of a production cutback due to reduced export demand. Despite this, nickel remained among the top traditional mineral exports of the Philippines. In 1983, nickel exports contributed about $US 30 million to the total mineral export earnings, which, however, were estimated to have dropped drastically to $US 3 million by 1984.

106. In New Caledonia, output of nickel ore, the principal mineral produced, declined in 1982 to 60,000 tons, down 23 per cent on 1981. Production of nickel matte declined significantly but output of ferronickel remained at about the 1981 level. Production gained marginally in 1983 to about 63,000 tons. Société Métallurgique de Nickel (SLN), the sole nickel mining company, operates four major mines located at Kouaoua Poro, Thio and Nepoui and a number of small mines. All the ore is fed to the Doniambo smelter complex which produces ferronickel of varying grades and nickel matte. Most of the matte was shipped to the SLN refinery at Sandonville, France.

Table 5. Mine production of nickel in selected countries and areas in the Asian and Pacific region

(Tons)

Country or area	1981	1982	1983	1984
Australia - concentrate	416 012	464 778	487 178	246 050[a/]
- in mine products	74 355	87 552	76 625	37 032
Burma - speiss content	14	20[b/]	20[b/]	...
China - metal	10 000	10 000	8 000[b/]	...
Indonesia - metallic content	48 850	55 000[b/]	47 000[b/]	...
New Caledonia - metallic content	78 090	60 100	62 960	...
Philippines - metal	23 928	19 634	13 900	11 894

a/ January - June

b/ Estimated

D. Chromium

107. Mine production of chromite in the region continued to decline from about 1 million tons/year in the late 1970s to an estimated figure of around 0.7 million tons in 1983. Much of the decline was due to the fall in output in the Islamic Republic of Iran which now produces only small quantities for domestic consumption.

108. The Philippines is a leading producer of refractory grade chromite, the production of which however declined substantially in 1982 to about 180,000 tons, down 37 per cent on the output in 1981 of about 286,000 tons. It continued to drop to about 127,000 tons in 1984. The production of metallurgical grade ore after increasing to some 29,800 tons in 1982 declined to 22,500 tons in 1984. Metallurgical concentrate production continued to decline in the period and in 1984 only 106,000 tons was produced. The refractory chromite ore came from the Masinloc mine in Zambales province. There was considerable activity in the metallurgical chromite sector in the Philippines in the period, when a new concentrator was completed in 1982, producing 101,000 tons of 48 per cent Cr_2O_3 in 1983. A large proportion of the product will be fed to the 50,000-tons/year ferrochromium plant which is currently under construction at Cagayan de Oro.

109. There was modest expansion in India's chromite industry in the period in response to the increases in ferrochromium capacity. Production of chromite ore was sustained at about 360,000 tons in the period. The estimated reserves of chromite in India of varying grades amount to 8.2 million tons, the majority of which is located in Orissa. The other major producer of chromite ore outside of Orissa is at Hassan district of Karnataka, with an output of about 80,000 tons/year.

110. Chromium ore prices, which were on the decline for some time, steadied in 1984 and moved upward. Price increases were modest. However, in the case of high ratio ores increases were substantial. Demand for ferrochromium was strong, primarily on account of record production levels in the stainless steel industry.

/Table 6.

Table 6. Chromite production in countries in the Asian and the Pacific region

(Tons)

Country	1981	1982	1983	1984
India	343 601	364 204	365 000	...
Iran, Islamic Republic of[a/]	30 000	30 000	30 000	...
Japan	10 959	11 129	8 396	6 001
Pakistan[a/]	1 000	3 000	3 000	...
Philippines:				
Metallurgical concentrate	136 619	112 597	111 818	106 697
Metallurgical ore	19 706	29 589	24 529	22 531
Refractory ore	286 442	179 680	130 562	127 415
Viet Nam[a/]	16 000	16 000	16 000	...

a/ Estimated

E. Tungsten

111. Tungsten suffered the impact of the industrial recession more than most metals as the consumption of tungsten in the major industrial market economy countries fell sharply in 1982 and 1983. Prices having peaked at $US 171 per metric ton unit (mtu - contains a minimum of 65 per cent WO_3) cif Europe, plunged to an average of just $US 80/mtu in 1983. To match the fall in demand, world production was cut back substantially with the largest producer, China, cutting its exports by almost 50 per cent in 1982. China introduced export licensing and lowered the volume of its exports to about 14,000 tons in 1982 in an effort to bring supply and demand into better balance. In 1984, demand made a recovery, returning to levels prevailing in 1980 and 1981, as consumption of tungsten in concentrates increased by 20 per cent, whilst world production increased by an estimated 11 per cent. In spite of the improved demand, prices remained virtually unchanged from 1983. Prices in 1984, having been weak at the beginning of the year, strengthened considerably towards mid-year but weakened again appreciably with prices for wolframite in Europe down sharply to $US 68-73/mtu at the end of December.

112. The tungsten market is dominated by China which reportedly possesses almost half of the known world reserves and accounts for about a quarter of the total world mine production. China's tungsten reserve base was estimated at 1.25 million tons of contained metal, mostly in the form of wolframite, in Jiangxi, Hunan and Quangdong provinces, and scheelite, mainly in Hunan province.

113. Australia's tungsten concentrate production dropped sharply to 4,636 tons in 1982, down 23 per cent from the previous year. It further declined to about 3,500 tons in 1983 and in the first six months of 1984 production registered at 1,450 tons only. The fall in Australia's production was directly due to the reduced world demand for tungsten.

114. Tungsten concentrate output in the Republic of Korea was sustained in the period, although declining to 4,361 tons in 1982 from 4,940 tons in 1981. Total production in 1984 was reported at 4,868 tons. Almost all of the production came from the Sandong mine which has a daily ore treating capacity of over 2,000 tons/day for an average run-of-mine ore grade of 0.54 per cent WO_3.

115. Thailand's production of tungsten concentrate after declining substantially to 1,257 tons in 1982 from 1,832 tons in 1981, fell to the lowest level in over a decade in 1983 to 815 tons. Wolframite output however gained marginally in 1984 to 1,144 tons. Scheelite production was at a high of 516 tons in 1981, but declined to 404 tons in 1982 and dropped sharply to 277 tons in 1983. Scheelite output gained slightly to 295 tons in 1984.

116. In an attempt to stabilize prices in the tungsten market, notorious for its volatility, nine tungsten producing countries have agreed to introduce measures to try and stabilize the tungsten market. Agreement in principle has been reached not to export it below minimum price levels, which would involve the introduction of market adjusted indicator prices for scheelite and wolframite. The nine countries, Australia, Bolivia, Brazil, China, France, Peru, Portugal, Thailand and Zaire have been meeting occassionally and were discussing the establishment of an association of tungsten producing and exporting countries.

/Table 7.

Table 7. Tungsten concentrate production in selected countries in the Asian and Pacific region

(Tons)

Country	1981	1982	1983	1984
Australia	6 017	4 636	3 529	1 450[a]
Burma	1 030	850	500[b]	...
China	17 000	17 000	14 000[b]	...
Democratic People's Republic of Korea	2 800	2 800[b]	...	...
India	39	53	40[b]	...
Japan	1 839	1 762	1 651	1 609
Malaysia	...	...	...	...
Republic of Korea	4 940	4 361	4 468	4 868
Thailand: Wolframite	1 832	1 257	815	1 144
Scheelite	516	404	277	295

a/ January - June

b/ Estimated

II. NON-FERROUS ORES AND METALS

A. Copper

117. During the first half of 1982, on a constant dollar basis, copper prices fell to their lowest level since the 1930s. Although they recovered somewhat towards the end of 1982 and throughout most of 1983, nevertheless, prices suffered heavily during the closing months of 1983. Copper prices rallied early in 1984 as generally optimistic speculation and huge imports by China buoyed the market, however the growing world refined copper inventories made its own impact felt and prices had declined by mid-1984.

118. Although copper has been in an oversupply situation during the past three years or so as the industrial recession has reduced demand, the impact of the price depression on production was uneven. Except for massive cutbacks in Canada and the United States of America and the modest cutback in the Philippines, production generally has been sustained at high levels in most regions. Citing social and foreign exchange needs, developing countries governments acted to keep their copper mines in production that otherwise would have closed down.

119. In 1983, world mine production estimated at 7,960,000 tons was marginally lower by 1 per cent than the 1982 total of some 8,040,000 tons and was somewhat lower than the 1981 figure. In the region, except for the Philippines, the principal producers registered gains in copper output in each of the past three years. The output in the Philippines, although continuing to lead the region in mine production, declined substantially by 26 per cent to 225,216 tons in 1984 compared with 305,262 tons in 1981. The year to year decline was 4.3 per cent in 1982 for a total production of 292,086 tons, 7.1 per cent in 1983 with output totalling 271,403 tons and in 1984 significantly dropped by 17 per cent to 225,216 tons.

120. The Philippines Associated Smelting and Refining (PASAR) copper smelter located on Leyte, the first copper smelter in the Philippines, was inaugurated in 1983. It was gradually built up to full capacity by year-end at which level it is capable of producing 138,000 tons/year of copper. The smelter uses the Furukawa-Mitsui flash smelting process. It also produces 450,000 tons of sulphuric acid which is being used for fertilizer production. PASAR is 60 per cent owned by private companies and 40 per cent by the State.

/121.

121. In the period under review, mine production of copper in Australia increased from 245,322 tons in 1982, up 6.2 per cent from 231,000 tons in 1981, to a record 261,475 tons in 1983. However, total production declined in 1984 to an estimated 222,000 tons as a result of mine closures due to depleted reserves. Production continued from Mount Isa, Cobar, Woodlaura, Mount Lyell and Teutonic Bore but ceased at Mount Chalmers, and at the Dianne mine in Queensland. Production from Mount Gunson declined markedly in 1984 as the mine ran out of reserves. The MIM Holding's Mount Isa mines continued to be the largest producer, with an output of about 145,000 tons, in 1983, and the company's smelter at Townsville produced 152,000 tons of refined copper. The economic copper reserves of Australia were estimated by the Bureau of Mineral Resources at some 5,320,000 tons with paramarginal reserves at 33.5 million tons.

122. The tonnage of copper metal exported from Australia, measured in terms of the estimated content of copper in ores, concentrates, blister, refinery shapes and semi-fabricated products, rose from 148,000 tons (or 60 per cent of domestic copper production) in 1982 to over 170,000 tons (77 per cent) in 1984. The major markets were Japan, the United Kingdom, the Federal Republic of Germany, France, New Zealand, and Belgium-Luxembourg. Most of the exports of concentrates and blister went to Japan while sales for the European and British markets accounted for most of the refined copper.

123. China's annual mine production of copper was estimated to have increased to around 280,000 tons per annum during the years under review. Imports of copper showed sharp increases during the period under review. In 1983, imports of copper and copper alloys were up to some 486,000 tons compared with 110,000 tons in 1982. Although imports in 1984 reportedly fell by nearly 50 per cent to 264,000 tons, they were still at historically high levels and well above the level in 1982.

124. Production from the Mamut Copper Mine in Sabah, East Malaysia, continued at a monthly average of 500,000 tons of ore and about 11,000 tons of concentrate grading about 24 per cent copper along with gold and silver as by-products. Malaysia's annual total mine production of copper was sustained at about 30,000 tons of metal in the period. All of the copper ore and concentrate output were exported to Japan.

/125.

125. Indonesia's only copper mine, Gunung Bijih at Tembagapura in Irian Jaya, increased its production of copper concentrates to a record high of 223,704 tons in 1982, which declined to 205,000 tons in 1983, while in 1984 it was estimated to have further declined. The copper concentrates were exported mainly to Japan. Production was gradually transferred from the open-pit mine (now about 90 per cent mined out) to the underground mine where nine blocks were in production. The original undiluted mineable ore reserves were estimated at 47 million tons. The metal content of the concentrates from the underground mine has improved to 39.80 per cent of copper compared to 34.84 per cent of the open-pit ore. The gold and silver content has similarly improved to 10.4 g/ton and 163,48 g/ton respectively. During the first half of 1984, expansion of the ore processing facilities was completed which raised daily throughput capacity to over 13,000 tons/day.

126. Assessment of the porphyry copper deposit in North Sulawesi continued and preliminary indications place reserves at 300 million tons at an average of 0.57 per cent copper and 0.47 g/ton of gold. Further exploration needs to be carried out before considering the possibility of development because of the complexity and location of the deposit.

127. Total mine production of copper from the Paguna Mine on Bougainville Island in Papua New Guinea in 1982 was 170,000 tons with 17,800 kg of gold. The Paguna Mine was recently re-evaluated to contain 720 million tons of ore averaging 0.40 per cent copper and 0.46 g/ton of gold. The mining of lower grade ores during 1983 was offset by larger ore throughput in excess of 130,000 tons/day, which resulted in the production of 183,191 tons of copper, 18,002 kg of gold and 47,414 kg of silver. Total mine output during January to October of 1984 amounted to 143,930 tons. The ore grade of Paguna porphyry decreases irregularly outwards towards the pit limits and downwards into the lower part of the orebody. As the pit extended, both in plan and at depth, an increasing proportion of lower grade meterial has been mined, with a resulting fall in head grades. In order to compensate for the falling grades, mill throughput has been progressively increased. An interesting point to note was that, although Paguna was clearly a copper mine with by-product gold values when production begin in 1972, 10 years later in 1982, the two metals were almost co-products as a result of changing metal prices.

/Gold

Gold production has increased about 40 per cent during the past decade and the value of the production in 1982 was close to $US 215 million. Copper production increased by about 37 per cent over the same period, but the value of production in 1982 was just over $US 250 million.

128. Development work continued at the Ok Tedi mine in Papua New Guinea's Western Province, where over Kina 1 billion (about $US 700 million) has been spent to bring the mine into operation. Gold production commenced during May 1984 from the leached capping of the deposit.

129. Total mine production of copper in India has been increasing significantly during the period. The output in 1982 increased 18 per cent to 30,360 tons compared with 25,680 tons in 1981. It further gained substantially to 43,080 tons in 1983 an increase of 42 per cent over 1982. Total production in the first six months of 1984 amounted to 24,340 tons and thus appeared headed for a record output. Hindustan Copper Ltd. began production from its Malanjkhand open pit copper mine in 1983. Current proven and probable reserves are put at about 76 million tons grading over 1.2 per cent copper using a cut-off 0.45 per cent copper. Drilling results indicate that the ore body increases in both thickness and grade with depth. Production was running at about 2 million tons/year run-of-mine ore. Cathode production made substantial gains to 36,000 tons in fiscal 1983/84 against 34,600 tons in 1982/83. The cathode production target set for 1984/85 was 52,500 tons. Currently, with an annual demand of about 90,000 tons of copper some 60,000 tons of the metal were imported annually.

130. The number of mines producing copper in Japan has declined from 71 in 1971 to 9 in 1984. The peak year for domestic copper mine production was 1969, when output was 121,000 tons. Japan's mine production of copper continued to decline gradually during the period, from 43,558 tons in 1981 to 37,433 tons in 1982, and declined 5 per cent to 35,586 tons in 1983. A further decline in the mine production occurred in 1984 with production registered at 33,761 tons. Imports of copper concentrate in 1983 of 3,140,000 tons were down by 14 per cent compared with 1982 imports and in 1984 dropped to 2,930,000 tons only. The leading suppliers of copper concentrates from the region were, the

Philippines with 20.6 per cent of the total imports in 1983, compared with 23.2 per cent in 1982, followed by Papua New Guinea, 11.1 per cent (8.40 per cent); Indonesia, 7.7 per cent (5.7 per cent); Australia, 7.6 per cent (4.4 per cent); and from Malaysia (Sabah). Smelter production of copper metal in 1983 was registered at 1,074,000 tons.

131. The Monywa copper mine in Burma came into operation in early 1984 with a current annual production in the 50,000-60,000 tons range. The concentrates graded at 22 per cent contains few impurities.

Table 8. Mine production of copper (Cu-content) in countries in the Asian and Pacific region

(Tons)

Country	1981	1982	1983	1984
Australia	231 000	245 322	261 475	109 753[a/]
China	200 000	...	...	...
Democratic People's Republic of Korea	15 000	...	...	...
India	25 680	30 360	43 080	24 340[a/]
Indonesia	58 440	69 360	63 600	28 010[a/]
Japan	43 558	37 433	35 586	33 761
Malaysia	28 642	30 600	29 390	29 100
Papua New Guinea	165 360	170 004	183 191	143 930[b/]
Philippines	305 262	292 086	271 403	225 216
Republic of Korea	1 920	2 130	2 593	1 858

a/ January-June 1984.

b/ January-October 1984, country report.

B. Lead

132. Lead prices have been most volatile in recent years, with prices declining sharply from record levels during the first half of 1979 (£709 per ton in June 1979) to a near seven-year low of £262 in July of 1983, owing to the imbalance between production and consumption resulting in an unusually high inventory. During 1982, although the prices did not fluctuate over a wide range, they dropped steadily from an average IME settlement price of £344/ton in January to £277 in December of the year. In 1983, on a constant dollar basis, lead prices were at historically low levels.

133. The downturn in prices notwithstanding, world mine production in 1982 was the highest since 1973, totalling 3,450 million tons. In 1983 the estimated total world mine production declined by some 3 per cent to 3,350 million tons. Although the outputs of lead mines in the industrial countries outside the region were at reduced levels, mine production in Australia, India, Japan and Thailand were stepped up.

134. In Australia the largest exporter of lead, accounting for about 20 per cent of total world exports, mine production of lead increased to a record high of 480,626 tons in 1983, up 5.5 per cent compared with 455,338 tons in 1982 which in turn increased significantly by 17 per cent over the 1981 production of 388,122 tons. The bulk of the mine production came from the mines at Mount Isa, Queensland and Broken Hill, New South Wales. A large increase occurred at Mount Isa in 1983, when production exceeded by 15 per cent the record output of 1982. The newly opened Elura mine in New South Wales, which came on stream in the early part of 1983, was gradually phased into production throughout 1983.

135. Broken Hill Associated Smelters Pty. Ltd. (BHAS) at Port Pirie, South Australia, is the sole producer of primary refined lead. It has a production capacity of 230,000 tons/year. Lead bullion is produced at Mount Isa and at Cockle Creek, New South Wales. Production capacity at Mount Isa was increased to around 180,000 tons in 1983 in line with increased mine production. Australia's lead bullion contains a substantial component of silver thus accounting for its high value.

136. Mine production of lead in India had a large percentage increase in 1983, gaining almost 49 per cent to 24,600 tons compared with 16,560

/tons in

tons in 1982. Hindustan Zinc Ltd., India's leading producer of zinc and the only producer of primary lead, was carrying out a programme of expansion designed to narrow the gap between the market demand for lead and the indigenous availability of the metal. In 1983, the expansion of one lead smelter was completed, the construction of another was started and two new mines were opened. The present demand for lead in India is between 65,000 tons and 70,000 tons per year and the shortfall in the indigenous supply was met by imports of about 40,000 tons/year of primary lead and the recycling of about 11,000 tons/year of secondary lead.

137. Mixed lead-zinc ore is Burma's principal metallic resource. Mine production of lead reportedly was raised to about 15,600 tons annually with the renovation of the Bawdwin mines.

138. In the Republic of Korea, mine output of lead from zinc ore declined 12 per cent to 12,160 tons in 1982 and further dropped substantially to 10,880 tons in 1984. About 35,000 tons of lead, mostly scrap and unwrought metal were imported annually to meet the domestic demand of about 50,000 tons.

139. In Thailand, lead concentrate output increased to an all-time high of 49,456 tons in 1983. This however dropped sharply by 20 per cent to 39,204 tons in 1984. Almost all the lead concentrates came from the Song Toh mine in Kanchanaburi and were mostly exported, the principal destination being Japan and the European Community.

140. Mine output of lead in China was reportedly at the level of 155,000 tons annually and to meet the domestic consumption unwrought lead and small tonnages of lead ore were imported.

141. Japan's mine production of lead was sustained at about 48,000 tons annually during the period. The peak year for production of lead from domestic ores was 1971 when 68,000 tons came from the mines. The downward trend in Japan's domestic ore production seems to have ceased and the mines remaining are relatively efficient low-cost.

142. Lead reserves in the Islamic Republic of Iran were estimated at about 2.6 million tons and currently lead mine output was some 10,000 tons annually. With reported construction in late 1984 of a lead and zinc smelter in the north, output levels of 60,000 tons/year of lead was projected within four years.

143. Although technological innovations, environmental factors and the shift in market structure have tended to depress demand, the bright spot in the future for lead is that the alternatives to the lead-acid battery for its major markets seemed some distance away. Lead-acid batteries continued to be the most important market for lead and the demand for the batteries were expected to grow in applications for traction batteries and standby power. However, pressure was building for a near-total ban on the use of tetra-ethyl lead as a fuel additive. The demand remained steady for lead as sheathing material for electric power cables, although increasingly substituted by plastics. Aluminium, tin, iron and plastics compete with lead in other packaging and protective coatings. Nevertheless, there was further potential for new or increased use of lead in a number of areas including transport, uninterruptable power supply systems, use in paved asphalt roads and roofing material to prevent atmospheric degradation and in the disposal of nuclear waste material.

144. The London-based Lead Development Association (LDA) has launched a major campaign aimed at promoting the safe and positive uses of lead. The impetus for the campaign stemmed from a pilot opinion survey, through which it was revealed that with few exceptions, there is a low awareness of lead. Many interviewees considered lead a declining, "sunset" industry with no modern applications for the metal. The campaign has two major objectives: to show that the lead industry takes a responsible and concerned attitude towards public health, safety and the environment; and to demonstrate that lead is a versatile, in many cases indispensable, metal which can, and should, be used safely.

/Table 9.

Table 9. Mine production of lead (Pb-content) in countries in the Asian and Pacific region

(Tons)

Country	1981	1982	1983	1984
Australia	388 122	455 338	480 626	195 173[a/]
Burma	15 600	...	...	...
China	155 000	...	...	...
India	15 240	16 560	24 600	11 520[a/]
Iran, Islamic Republic of	10 000	...	...	...
Japan	48 937	48 660	48 050	47 422
Republic of Korea	13 850	12 160	12 225	10 830
Thailand	17 273	18 580	21 019	16 662
(Ore)	(40 642)	(43 718)	(49 456)	(39 204)

a/ January-June, 1984.

C. Zinc

145. World mine production of zinc in 1982 increased to 6,010,000 tons from 5,840,000 tons the previous year and further gained to 6,160,000 tons in 1983. A review of 1984 indicated a record zinc mine output with an increase of about 4 per cent compared with 1983. In the region, mine production of zinc in Australia and India registered significant gains in each of the years under review. China's mine output of zinc was reportedly stepped up and in Japan mine production was sustained in the period. In the Philippines zinc concentrate production continued to decline substantially.

146. Zinc prices were depressed throughout 1982 and the first few months of 1983 as a result of the industrial recession which had severely reduced demand in Europe and North America. Since the middle of 1983, a steady and substantial improvement in zinc prices has developed; an average LME cash price of £443 per ton in 1982 to a 1983 average of about £506. In the second half of 1983, there was a strong increase in zinc consumption, with full-year consumption showing a some 7 per cent increase over 1982. China's imports of zinc metal were reportedly about 200,000 tons in 1983. In early 1984, the LME cash quotation advanced markedly and the market became increasingly volatile.

147. Australia's mine production of zinc gained 28 per cent to 664,800 tons in 1982, over the previous year, and in 1983 mine output of zinc was at a record level of 703,252 tons. Total mine production during the first half of 1984 was estimated at 292,786 tons. All zinc was produced as a co-product of lead, except at the Teutonic Bore, Western Australia, where it is a co-product of copper. In 1983, Australia was the second largest exporter of zinc in the world after Canada. Exports of zinc concentrates increased substantially in 1983 because of increased demand and also because the bulk of Mount Isa production was exported. Zinc concentrates were exported mainly to Japan, the Netherlands, the Republic of Korea, and the United Kingdom. Refined metal was exported mainly to China, Indonesia, New Zealand, Thailand and the United States of America.

148. Total mine production in China was estimated to have increased to about 160,000 tons annually during the period. Imports of zinc and zinc alloys rose sharply from about 12,000 tons in 1981 to 108,000 tons in

1982, to 228,000 tons in 1983 and 225,000 tons in 1984. Although China has a long history of lead-zinc mining, the metal output of lead and zinc was relatively limited. Installed capacity to produce zinc metal was reportedly some 250,000 tons per year.

149. Mine production of zinc concentrates continued to decline substantially in the Philippines, with mine output in 1984 down to a low of 2,103 tons.

150. Burma's mine output of zinc registered a substantial gain to 10,000 tons in 1982.

151. In the Islamic Republic of Iran, the Metals and Mines Department estimated zinc reserves around 7 million tons and the national news agency reported in 1983 the construction of a metallurgical plant scheduled to come on stream with a zinc output capacity of 40,000 tons/year.

152. With the discovery of lead-zinc deposits in Bhilwara district in Rajasthan, India's total known lead-zinc reserves have risen to 372 million tons. The newly located deposits are not only large in size but contain over 15 per cent combined zinc and lead. Estimates place the deposits at 60,350,000 tons, grading 13.5 per cent zinc, 1.5 per cent lead, 450 g/ton cadmium and 43 g/ton silver. Mine production of zinc, after having dropped marginally from 34,200 tons in 1981 to 31,320 tons in 1982, gained substantially by 43 per cent to 44,760 tons in 1983. In the first half of 1984, mine output of zinc was estimated at 25,780 tons and thus appeared headed for a record output. India's total zinc smelting capacity is 89,000 tons per year distributed between three smelters at Debasi in Rajasthan, Vishakhapatnam and Cochin. The latter two coastal smelters process imported concentrates. India's consumption of zinc was 1.3 million tons in 1982/83 and a probable 1,380,000 tons in 1983/84.

153. In Japan, mine output of zinc was maintained at about 250,000 tons annually in the period, having declined about 11 per cent compared with the peak year in 1971 with a total mine production of zinc of 282,000 tons. Total smelter production of zinc was estimated at 662,380 tons in 1983.

/154.

154. Thailand reported its first mine production of zinc ore in 1984, totalling 147,993 tons, from the Mae Sot Mine, an open-pit mine with a production capacity of about 300,000 tons/year of ore. The reserves at the mine were estimated at 4.5 million tons. Construction on the 60,000 tons/year electrolytic refinery, located in Tak, began in May 1982 and commissioning trials began in October 1984 a few months ahead of schedule. The mine is about 90 km due north-west of the smelter. Both the mine and smelter were operated by Padaeng Industry Co., Ltd.

155. Zinc production from domestic ores in the Republic of Korea, although having gained 3 per cent to 58,178 tons in 1982 compared with 1981, declined over the next two years, to 55,980 tons in 1983 and dropped substantially to 49,232 tons in 1984.

156. Zinc coatings, mainly galvanizing, continued to grow in importance as the major use of zinc. However, plastic coatings, paints, electroplated cadmium and aluminium-zinc coatings were increasingly used to replace zinc in limited areas for corrosion protection. The brass and die-casting sectors continued to be adversely affected by the downturn in automobile manufacturing, general engineering and construction. Although any substantial improvement in the world economy would result in an upturn in the demand for zinc, it is apparent that mine and metal production would adequately meet likely demand in the near future.

Table 10. Mine production of zinc (content of concentrates) in countries in the Asian and Pacific region

(Tons)

Country	1981	1982	1983	1984
Australia	518 297	664 800	703 252	292 786[a/]
Burma	7 282	10 000	...	...
China	160 000	...	...	...
India	34 200	31 320	44 760	25 780[a/]
Japan	237 807	233 591	254 869	230 659
Philippines	5 828	3 003	2 275	2 103
Republic of Korea	56 500	58 175	55 980	49 232
Thailand	-	-	-	41 500[b/]

a/ January-June 1984.

b/ Estimated.

D. Tin

157. During the period under review, tin continued to be subject to weak demand and endemic over-supply, although tin prices have remained high, achieving the best average of all base metals between 1970 and 1983, underlining the commitment of the producer signatories to the International Tin Agreement governing both its prices and supply. Export and production controls were instituted to contain the tin surplus, severely affecting the economies of the tin-producing developing countries in the region, falling revenues resulting from export restrictions. Controls of tin exports by producer signatories to the sixth International Tin Agreement started on 1 July 1982 at 36 per cent of pre-export control levels which was further tightened to almost 40 per cent in the third quarter of 1983 and continued throughout 1984. Although the export controls had reined back production in the producing member countries of the International Tin Agreement, in terms of world production, it was to some extent offset by rising production in countries other than the producing member countries and by an increase in the illegal trade in tin.

158. The drop in demand for tin in recent years has been more than cyclical given the structural decline in world consumption as aluminium and plastics, for instance, have been gaining bigger shares of the packaging market at tin's expense. Technological innovations have also reduced the amount of tin metal needed to make tinplate. No doubt, the major effect on the demand was the result of the deep and prolonged economic recession since the latter part of 1980, reflected in the levels of comsumption in the major industrial countries where large falls have occurred in both the United States of America and the European Economic Community and to a lesser extent in Japan.

159. World tin production declined continuously during the period, consequent to tin export controls, mainly at a heavy economic and social price to the developing producer member countries of the International Tin Agreement. In 1982, production declined nearly 7 per cent to 190,500 tons and by a further 9 per cent to 172,800 tons in 1983. It was estimated that production in 1984 would be even lower at about 167,000 tons. Meanwhile, the underlying supply demand picture was grim, with

/consumption

consumption declining substantially by some 22 per cent between 1981 and 1983. The swiftly rising Brazilian tin-in-concentrates production, a growing worry, gained almost 62 per cent in 1983 to 13,275 tons from 8,218 tons in 1982 and is likely to have gained 23 per cent to 16,000 tons in 1984.

160. In Malaysia, the world's largest tin producer and consequently the most affected by a depressed market, there was a gradual decline in tin production in line with production controls imposed under the sixth International Tin Agreement. The severe restriction on exports has severely affected the Malaysian tin industry, with drastic retrenchments as the number of workers directly involved in all tin mines in Peninsular Malaysia at the end of 1983 dropped to 25,641 compared with 35,198 at the end of 1981. It represented a fall of 34 per cent if compared with the 39,000 employed at the end of 1980. In addition, the number of active tin mines dropped to 547 by the end of 1983 compared with 852 at the end of 1980 for a net closure of 305 mines in the three year period. Malaysia's tin-in-concentrates production in 1982 declined almost 13 per cent to 52,432 tons from 59,938 tons in 1981, further declining to 41,367 tons in 1983, a loss of 21 per cent over 1982. Total production in 1984 was estimated to have dropped to a low of 40,500 tons.

161. Despite the sharp decline in production in tin-in-concentrates from 35,268 tons in 1981 to 33,800 tons in 1982, the first fall in output since 1976, and further to 26,554 tons in 1983, Indonesia maintained its position as the world's second largest producer after Malaysia. Production of tin metal from the Mentok smelter declined from 32,429 tons in 1981 to 29,754 tons in 1982 and to 28,890 tons in 1983. PT Tambang Timah the national tin enterprise was constructing a tin plate factory scheduled for completion in 1986/87, in the Cilegon area of Java, with a capacity of 130,000 tons/year of tin plate, to meet the increasing domestic demand for the metal.

162. There was a sharp drop in the tin concentrate production of Thailand, from 42,968 tons in 1981 to 35,644 tons in 1982 and to a low of 27,228 tons in 1983, declining almost 37 per cent over a two-year period. However, in 1984 tin concentrate output was reported to have gained 10 per cent to 29,978 tons. The pattern of tin production remained the same. However, the contribution from suction boats continued to decline,

/down to

down to 20.1 per cent of the total production in 1983 compared with 32.9 per cent in 1981. The progressive decline in output of the suction boat sector underlines the depletion of easily-won shallow water deposits of the coast off Phangnga and Takuapa. Virtually all tin metal production came from the Thai-sarco smelter in Phukhet as the Thai Pioneer Enterprise Co., Ltd. smelter closed down indefinitely in May 1982. Primary tin metal production declined sharply, down 44 per cent to 18,467 tons in 1983 compared with 32,636 tons in 1981.

163. Australia's mine production fell markedly in the last three years because of the export controls. About three quarters of Australian production came from three lode mines, Renison, Ardlethan and Cleveland. Several medium-sized operations with production in the 100-200 tons/year range closed in the period as economic reserves were depleted. Two new alluvial operations in the same size range began production in 1984. Australia's potential was increasing with known reserves at several prospects increased as a result of exploration. Consumption of primary tin continued to fall in Australia because of decreasing consumption in tinplate and alloys. Malaysia remained the main destination for exports of tin concentrate. Exports of refined tin fell, in line with greatly decreased production, down 24 per cent to 9,252 tons in 1983 from 12,093 tons in 1982. Total tin-in-concentrate production in the first six-months of 1984 was estimated at 3,855 tons only.

164. Although no reliable information was available, China's tin-in-concentrates production was estimated at some 16,000 tons per year, mostly from the Dachang mine in Guangxi which reportedly has an installed annual capacity of 10,000 tons of tin. According to industry estimates, there was a marked decline in tin metal exports from China in the first half of 1984 of 1,029 tons, compared with 3,643 tons in 1983.

165. Among the smaller tin producing countries in the region, output in Burma increased to 1,063 tons in 1982, but was down to 931 tons in 1983. Industry sources reported that Burma's refined tin output rose to 500 tons in 1983/84, up from 450 tons the previous year and that Burma exported 717 tons of high-grade (74 per cent) tin concentrates and 320 tons of tin metal in 1983.

166. Tin was the only mineral that was reportedly exploited in the Lao People's Democratic Republic with two mines in production. Their combined output was estimated at 600 tons of tin-in-concentrate annually. The Lao concentrates were sent to Malaysia for smelting.

167. In India, production from the first commercially exploitable tin mine in Orissa was reportedly started in 1984. The mine located near Koraput was expected to have an initial production of 30 tons per year. India's volume of tin imports has been declining gradually, 2,605 tons in 1981/82, 2,250 tons in 1982/83, and about 2,100 tons in 1983-84.

168. The Association of Tin Producing Countries (ATPC) was established in 1983 and currently its membership includes Bolivia and six producing members of the International Tin Council, Australia, Indonesia, Malaysia, Nigeria, Thailand and Zaire. The ATPC group together produces some 93 per cent of world tin supply. The primary objective of ATPC was to stabilize the market and increase tin consumption through product development and promotion. ATPC has its headquarters in Kuala Lumpur.

Table 11. Tin-in-concentrates production in selected countries in the Asian and Pacific region

(Tons)

Country	1981	1982	1983	1984
Australia	12 233	12 093	9 252	3 855[a/]
Burma	971	1 063	931	402[a/]
China	16 000	...	...	...
Indonesia	35 268	33 800	26 554	11 798[a/]
Japan	564	529	599	240[a/]
Lao People's Democratic Republic	600[b/]	600[b/]	600[b/]	...
Malaysia	59 938	52 342	41 367	41 307
Thailand	31 474	26 207	19 942	21 958[b/]
(concentrates)	(42 958)	(25 644)	(27 225)	(29 978)

a/ January-June 1984.

b/ Estimated.

E. Aluminium and bauxite

169. Several significant changes have taken place in recent years in the structure of international trade in bauxite and alumina. In particular, the traditional dominance of the industry by a small number of vertically integrated transnational concerns has been slowly eroded. There have also been changes in the patterns of raw materials supply with bauxite increasingly converted to alumina at source rather than in the traditional consuming regions of North America, Western Europe and Japan. Escalating energy costs have been largely responsible for the shift in the pattern of ownership and control of the industry. The market share and influence of the traditional major producers will likely continue to decline as developing countries harness their energy potential and build their own smelters.

170. Although Australia retained its position as the world's leading producer of bauxite, its production has declined considerably in the period under review because of the decreased demand for alumina and aluminium as a result of the world economic recession. Its output of bauxite in 1982 at about 23.6 million tons was 7 per cent down on that for 1981. In 1983, bauxite output rose by some 4 per cent to 24.8 million tons. During the first six months of 1984, production was registered at 15.6 million tons and thus appeared headed for a substantial gain. The increase is attributable to improved economic conditions and the additional production from the new bauxite mines at Mount William and Mount Saddleback in the Darling Ranges, Western Australia.

171. Proved bauxite reserves in Australia total 4.6 billion tons. Australia is the world's largest producer of alumina with capacity scheduled to reach some 9 million tons by the end of 1984. Production of aluminium declined substantially in 1982 to 6.6 million tons from 7.1 million tons in 1981. It however regained to some 7.3 million tons in 1983. With the expansion of a refinery together with the coming-on-stream of two new refineries in Western Australia, production in 1984 was estimated to exceed 8 million tons. Annual production of primary aluminium increased over the three-year period to the end of 1984 by about 350,000 tons to about 757,000 tons. The higher production reflects the completion of two new smelters, Boyne Island smelter in Queensland and Tomago smelter in New South Wales.

/172.

172. India's bauxite reserves are estimated at over 2 billion tons of which some 1.5 billion tons are to be found in Andhra Pradesh, Bihar and Orissa. Bauxite production was registered at 1,857,000 tons and 1,886,000 tons in 1982 and 1983 respectively, slightly down from 1981 with an output of 1,923,000 tons. 1984 should see a substantial increase in production as 1,098,000 tons was recorded during the first six months of the year. Bihar is the largest producer accounting for 40 per cent of the total production. The Orissa deposit is being developed with a targetted annual output of 2.5 million tons of bauxite. The project includes an alumina plant with ultimate capacity of 0.8 million tons/year and a 220,000 tons/year aluminium smelter. It also includes a 600 MW captive power plant. India became a member of the International Bauxite Association, the producers' organization in 1983.

173. Primary aluminium production in India continued to be affected by power supply problems which have prevented existing aluminium smelters from operating at their installed capacities. In the twelve months ended 31 March 1984, for example, Indian plant production was just 220,000 tons against a total installed capacity of 362,000 tons. In the same period, India reportedly imported 30,000 tons of aluminium.

174. China's production of bauxite was reportedly sustained at about 1.5 million tons a year. China has large bauxite deposits, in the order of 1 billion tons. Annual primary aluminium production was reportedly at about 360,000 tons and China continued to expand the capacity with several new plants going into operation in the period.

175. In Indonesia, bauxite production and exports from Bintan Island, the only bauxite mine operated by P.T. Aneka Tambang, were drastically reduced in 1982 as Japan curtailed its offtake with the further cutbacks in primary aluminium production capacity in Japan. Accordingly, bauxite production declined by almost 42 per cent from 1.2 million tons in 1981 to 0.7 million tons in 1982. Output in 1983 gained marginally to 778,000 tons and during the first half of 1984 production was registered at 443,000 tons.

176. Production of primary aluminium began at the Asahan smelter at Kuala Tanjung, Sumatra, in February 1982, when production began from the first 75,000 tons/year potline. Output in 1982 was registered at 25,000 tons. The second potline was started up in 1983 and the third was

/scheduled

scheduled in 1984, raising capacity to 225,000 tons. Primary aluminium output in 1983 was in excess of 100,000 tons. The alumina refinery on Bintan Island was reportedly halted following a review by the Government of its investment programme and on-site work has been deferred indefinitely.

177. Malaysian mine production of bauxite from the Telok Ramunia Mine, near Pengerang in Johore, and the nearby Sungei Rengit mine continued to decline. Mine production were cutback as a result of further reductions in the export of bauxite, particularly to Japan. Total output in 1982 dropped 16 per cent to 589,000 tons compared with 700,000 tons in 1981. After further declining to 502,000 tons in 1983, production w.nt up to 680,000 tons in 1984. There were plans to establish a calcining facility at Ramunia within the next few years and in this regard raw bauxite sales from the mine were restricted to the higher iron-containing material whilst conserving the low-iron bauxite required for refractories, for calcining at a later stage. The output at Sungei Rengit mine, however, was largely concerned with metallurgical and chemical grades of bauxite.

178. The effective operating capacity of aluminium production in Japan continued to decline, with a sharp drop in output in 1982 to 351,000 tons from 771,000 tons the previous year. The output of primary aluminium further declined to 256,000 tons in 1983 and in 1984 increased slightly to 287,000 tons. Most of the domestic demand was met by imports which were in the range of 1.4 million tons annually. Almost one half of the imported tonnage came from plants in which Japanese aluminium producers have an equity interest. By 1983, effective smelter capacity had declined to 712,000 tons/year, giving an operating rate of only 36 per cent. The primary cause of the high rate of decline in operating capacity was because most of the Japan's aluminium production capacity had relied on oil-fired electrical power. The high price of imported oil and the steady decline in the free market price of aluminium resulted in a large difference in the price of imported metal and the cost of demostic production. An advisory committee to the Japanese Government has reportedly recommended the permanent closure of all smelter capacities already shut down.

179. In New Zealand, the smelter at Bluff operated above its nominal capacity to produce 163,000 tons in 1982, up 5.5 per cent compared with 154,000 tons in 1981. The plant's capacity was increased to 244,000 tons/year with the commissioning of the third potline in 1983, and

production was increased substantially to 218,000 tons. The plant was operating at full capacity in 1984 and in the first half of 1984 primary aluminium output was registered at 120,000 tons. The planned construction of a second smelter near Dunedin was postponed because of problems in the power supply.

Table 12. Bauxite production in selected countries in the Asian and Pacific region

(Thousand tons)

Country	1981	1982	1983	1984
Australia	25 441	23 625	24 540	15 663[a/]
China	1 500	...	...	...
India	1 923	1 857	1 886	1 098[a/]
Indonesia	1 203	704	778	443[a/]
Malaysia	700	589	502	680
Pakistan (tons)	1 754	2 755	3 563	...

a/ January to June, 1984.

Table 13. Primary aluminium production in selected countries in the Asian and Pacific region

(Thousand tons)

Country	1981	1982	1983	1984
Australia	360	381	478	549[a/]
China	360	360	...	...
India	213	216	204	121[b/]
Japan	771	351	256	287
New Zealand	154	163	218	120[b/]
Republic of Korea	17	15	...	...

a/ First three quarters of 1984.

b/ January to June, 1984.

F. Antimony

180. World production of antimony has fallen steadily over the past six-year period, with an overall decline in output of almost 20 per cent, a massive drop in production reflecting the decline that has affected the antimony market. At the end of 1977 world mine production on antimony metal totalled 70,000 tons and by the end of 1983, it was estimated to have fallen to 55,800 tons. Of the total world mine production, almost 76 per cent originated from Bolivia, China, South Africa and the USSR, where stibnite together with its oxidized equivalent forms the main ore mineral of antimony. In 1982, China's production contributed some 17 per cent of world production. Total estimated world resources of antimony were about 5.6 million tons with over half occurring in China.

181. Antimony output falls into two basic groups; primary production where antimony ore is mined as the major economic resource or as a by-product in base metal mining; and secondary production where it is won from scrap metal, principally antimonial-lead.

182. The principal producing countries of antimony in the region are Australia, China and Thailand, with smaller outputs coming from Burma and Malaysia.

183. China's mine production has remained steady, with only a slight decline to an estimated 9,000 tons/year in 1982 and 1983. In the 1960s, China was the largest producer but it has since been superseded by other countries. Production is concentrated in the provinces of Hunan and Guangdong. Antimony metal exports however seemed to be holding, in excess of 12,000 tons annually, with 12,216 tons exported in 1983. In 1984, exports of antimony metal were reportedly 16,727 tons.

184. Australian mine output of antimony fell drastically, from 2,275 tons in 1982 to 649 tons in 1983. Production in the first half of 1984 was 429 tons. Antimony is mined mainly in the northern part of New South Wales from the Hillgrove mines near Armidale.

185. Mine production of antimony virtually ceased in Malaysia in 1984 when only 28 tons was reportedly produced. Output in 1982 and 1983 had been 213 and 224 tons respectively.

186. Burma's production apparently continued to decline, with the last reported figure of 350 tons in 1981 being down 20 per cent over the previous year.

/187.

187. In Pakistan antimony production in 1982 gained marginally to 51 tons.

188. Antimony ore production in Thailand steadily declined over the years to 1,567 tons in 1982, which represented less than a third of the 1977 value. The decline in production was mainly due to demand being sporadic and unreliable. However, in 1983 production regained to 2,808 tons and increased significantly to 4,636 tons in 1984.

189. The past few years have seen a steady fall in demand for antimony, largely as a result of its reduced use by the battery industry. However, a marked improvement in the demand for antimony metal from the battery industry since the middle of 1983, has lifted the antimony metal market off the low point reached at the end of 1982.

190. The greatest production of antimony was for non-metallic applications, principally the use of antimony oxide in flame retardants, which have become the dominant market for primary antimony. Other non-metallic uses of antimony include; plastics, where antimony oxides are used as catalysts particularly in the textile fibre industry; rubber products, as a vulcanizing agent; pigments, where antimony oxide is used as a white pigment, whilst antimony trisulphide is used in camouflage paints because it reflects infrared radiation in the same way as green vegetation; fireworks; ammunition primers; and in ceramics and glass.

/Table 14.

Table 14. Antimony production (metal contained in ores and concentrates) in selected countries in the Asian and Pacific region

(Tons)

Country	1981	1982	1983	1984
Australia				
Ores to concentrate	948	1 029	111	160[a/]
In mine products	1 126	1 146	538	269[a/]
Burma	350	...	...	...
China	10 000	9 000[b/]	9 000[b/]	...
Malaysia	318	213	224	28
Pakistan	39	51	...	...
Thailand	1 692	940	1 685	2 780
(ore)	(2 820)	(1 567)	(2 808)	(4 636)

a/ January to June, 1984.

b/ Estimated.

III. PRECIOUS METALS

A. Gold

191. From the low levels in the second quarter of 1982, the gold market recovered to about $US 400/troy ounce[3/] towards the end of the year. However, despite the rise in price during the last month of 1982, the average price decreased by 18.5 per cent of $US 376/t oz in 1982 from $US 462/t oz in 1981. During 1983 and 1984, the trend in the dollar price of gold has proved disappointing. In the first two months of 1983, the price broke through $US 500/t oz but the buoyancy was short-lived as lack of physical demand undermined the price and at one stage it fell to $US 408/t oz before settling in a $US 400-$US 445/t oz trading range for most of the year. Then it dropped below $US 400 in October and remained there until the end of 1983. The dollar price of gold plunged in 1984, having started off the year at $US 383/t oz, declining sharply to $US 309/t oz on the final day's trading of 1984, averaging $US 360/t oz for the year. However, the fall in the "gold price' in dollar terms over the two-year period or so was as much an expression of the increased value of the dollar as of a change in the value of the gold. The "gold price" in most other currencies remained within a few percentage points of all time highs.

192. World mine production of gold rose in 1982 to about 1,328 tons, compared with 1,268 tons in 1981. Mine output marginally increased to about 1,384 tons in 1983 and in 1984 output was estimated to have reached 1,437 tons. Total world resources of gold are estimated at about 75 thousand tons of which 15 to 20 per cent are by-product resources. Of the total resources about one half is in South Africa.

193. Mine production of gold in countries in the region increased in the period, with China's output rising dramatically to about 55,985 kg in 1982 and further increasing substantially to about 59,096 kg in 1983. Three major sites were being developed in Shandong province in eastern China. The mine reportedly could produce good grade ore containing from 6 to 13.6 g/ton of gold. There is widespread occurrence of gold deposits of varying importance in China, but most of the known large ones are in the northern and eastern parts of the country. Prospecting for new deposits continued unabated. Production at existing mines continued to be expanded with modernization of facilities.

/194.

3/ 1 troy ounce (t oz) = 31.103 g.

194. Australia's gold production increased significantly in the period having jumped by nearly half in 1982 to 26,961 kg from 18,374 kg in 1981. Whilst the increase was less marked in 1983 than in the previous year, output in 1983 was recorded at 30,739 kg. Mine output in the first half of 1984 was registered at 16,698 kg and the upward trend is likely to be maintained over the next three years at least. Western Australia remained by far the largest producer of gold in Australia accounting for 77 per cent of the production in 1983. The three largest mines in Australia are in Western Australia. Most of the gold produced in New South Wales and Tasmania is a by-product of lead-zinc-silver production.

195. The Philippines' total gold production in 1982 gained 10 per cent to 26,961 kg compared with 23,521 kg in 1981. The greatest contribution to the overall increase was small-scale alluvial mining. Of the total, about 11 tons were from primary production and about 15 tons were recovered as a by-product of copper mining. Total production in 1984 came to 24,825 kg, a fall of 2.25 per cent on the 1983 production of 25,397 kg. The decline was attributed to lower world prices and increased operating costs.

196. Total gold output in Papua New Guinea increased to 17,764 kg in 1982 compared with 16,830 kg in 1981, and to 18,296 kg in 1983. For the first 10 months in 1984, total production was registered at 14,346 kg. Most of the gold production came from the Paguna Mine on Bougainville Island as a by-product of copper. The other source of gold production were the lode and alluvial mining activities at Wau where increased efficiency, higher mill throughput and increased metallurgical recovery, resulted in the lode gold/silver production during 1983 of 167 kg of gold and 116 kg of silver being significantly higher than in 1982. Output in 1984 from the alluvial sources at Wau was 129 kg of gold and 96 kg of silver. In 1984, gold production commenced at the Ok Tedi project with the commissioning of the first stage of mining of the gold-rich leached capping.

197. Fiji's total gold production from the Emperor Mine at Vatukoula made significant gains during the period under review, having increased to 1,456 kg in 1982, up 52 per cent on the 1981 output of 957 kg. After declining to 1,246 kg in 1983, total gold production in 1984 was reportedly at a high of 1,675 kg. There was increased activity in gold exploration, with diamond drilling in the Nasomo Prospect having

/intersected

intersected gold values up to 220 g/ton over 0.80 m. In fiscal year 1983/84, in excess of 6,000 metres of drilling were completed together with geological, geophysical and geochemical surveys.

198. Gold output in New Zealand increased steadily to 242 kg in 1982 from 200 kg in 1981 and further gained to 301 kg in 1983. There were over 70 small alluvial gold plants operating on the west coast and in Otago.

199. Total gold production in the Republic of Korea made substantial gains, having increased 34 per cent to 1,934 kg in 1982, compared with 1,287 kg in 1981, and further gaining 29 per cent to 2,242 kg in 1983. Output in 1984 saw a further increase to 2,462 kg, a sharp jump of 91 per cent in the three-year period under review.

200. Mine production of gold in India was sustained, after declining 10 per cent to 2,244 kg in 1982 compared with 2,495 kg in 1981. The bulk of the output came from the Kolar gold field owned by the Central Government and from the Hutti gold mine operated by the Karnataka State Government.

201. In Japan, the Hishikari mine some 45 km northwest of Kagoshima City on Kyushu Island was being developed. Sumitomo Metal Mining Company, the developers of the property, have carried out a diamond drilling programme completing 18 inclined holes totalling about 6,870 metres, to intersect a north-east striking, north-west dipping quartz vein type system. Typical intersections consisted of 47.3 g/ton gold and 26.8 g/ton silver over 4.05 m in one hole and in another 456.2 g/ton gold and 283.0 g/ton silver over 3.70 m. In general the gold to silver ratio was about 100:60. Estimated reserves were of about 1.5 thousand tons of high grade ore, containing perhaps some 120 tons of gold. Further exploration was being undertaken by underground development with twin inclines (17^{o}). At full production, Hishikari will rank as Japan's largest gold mine, displacing Mitsubishi Metal Corporation's Sado mine where reserves were originally estimated at 77 tons of gold.

202. There are many developing countries in the region with small but possibly significant gold deposits. Although in the past some of those countries had significant gold mining sectors, they are failing to take advantage of these valuable indigenous resources. Of all major metal products, gold has posted the most dramatic price increase having more

/than

than doubled in real value since the early 1970s. Given the traditional emphasis in their mining sector, development by the developing countries and, moreover, by the donor countries for large base metals, coal and iron projects, small gold mines in remote tropical areas held little attraction. In this connection, it is noteworthy that rather than the alluvial gold deposits, the most productive areas for small-scale gold mining could be the gold-bearing reefs within greenstone belts distributed widely in the region. With a modest amount of equipment, good technical advice and correct incentives, small gold mines can be more efficient and productive, and can make contributions of consequence to the national economy.

Table 15. Mine production of gold in selected countries of the ESCAP region

(Kilograms)

Country	1981	1982	1983	1984
Australia	18 374	26 961	30 739	16 698[a/]
China	52 876	55 986	59 096	...
Democratic People's Republic of Korea	5 000	5 000	...	...
Fiji	957	1 456	1 246	1 675
India	2 495	2 244	2 240[b/]	...
Indonesia	183	223	260[b/]	...
Japan	5 798	5 612	5 887	7 005
Malaysia	180	185	219	548
New Zealand	200	242	301	...
Papua New Guinea	16 830	17 764	18 296	14 346[c/]
Philippines	23 521	25 953	25 397	24 825
Republic of Korea	1 287	1 734	2 242	2 462

a/ January to June 1984.

b/ Estimated.

c/ January to October 1984.

B. Silver

203. The volatility of the price of silver continued in 1982, with prices in the first six months of the year decreasing by half to slightly less than $US 5/t oz. In the second half of the year, they more than doubled to about $US 11/t oz at the end of the year. In 1983, the price change pattern was of a more gentle nature averaging about $US 11.50/t oz in the year. Silver prices fluctuated in the first half of 1984, averaging about $US 9/t oz, while in the second half then declined further to about $US 6/t oz at the end of the year.

204. World mine production of silver totalled 11,586 tons in 1982 and in 1983 increased to about 12,130 tons. About 60 per cent of mine output of silver was produced as a by-product of base metals mining. Although recent increased exploration instigated by favourable prices led to new discoveries, most significant increases in known reserves and resources were expected to come as by-products from major base metal discoveries.

205. The total mine output of silver in the region increased steadily during the period under review as most of the major producers registered continued production gains with the possible exception of India where production was sustained and the Philippines where by-product silver output declined.

206. Australia's mine production of silver showed substantial gains in the period, increasing 25 per cent to 906,863 kg in 1982 and further gaining 15 per cent to 1,042,828 kg in 1983. In the first six months of 1984 production was registered at 433,282 kg.

207. Output of silver in Papua New Guinea increased steadily during the period: to 43,258 kg in 1982 and 47,530 kg in 1983. The bulk of the silver came from the Paguna Mine on Bougainville Island with minor amounts from Wau.

208. Silver output in the Philippines gradually declined to 61,724 kg in 1982, to 56,696 kg in 1983 and to 50,073 kg in 1984, a decline of 20 per cent in the period on the total of 62,911 kg in 1981.

209. The Republic of Korea stepped up its mine production of silver, gaining substantially by 14 per cent to 100,683 kg in 1982 on 1981. Production increased to 116,916 kg in 1984.

/210.

210. With the successful renovation of the Bawdwin Mine, Burma's silver output increased to about 18,000 kg annually during the period.

211. After a peak production of 17,298 kg in 1981, India's mine output of silver declined substantially to 14,403 kg in 1982 and was maintained at about that level in the period.

212. At present, photographic applications account for about 40 per cent of total silver demand. Silver usage in electronic applications showed improvement and the sterlingware industry registered a gain in consumption.

Table 16. Mine production of silver in selected countries in the Asian and Pacific region

(Kilograms)

Country	1981	1982	1983	1984
Australia	723 062	906 863	1 042 828	433 282[a/]
Burma	16 330	17 915	17 915[b/]	...
China	78 000	...	...	...
Democratic People's Republic of Korea	50 000	50 000	...	...
Fiji	260	576	...	...
India	17 298	14 403	14 000[b/]	...
Indonesia	1 932	2 836	...	...
Japan	288 617	281 226	323 680	322 438
Papua New Guinea	40 000	43 258	47 530	38 889[c/]
Philippines	62 111	61 724	56 696	50 073[b/]
Republic of Korea	88 100	100 683	104 705	116 916

a/ January to June 1984.

b/ Estimated.

c/ January to October 1984.

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